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USSR Report

SCIENCE AND TECHNOLOGY POLICY

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FEDORENKO ON ECONOMIC MECHANISM, ACCELERATION OF PROGRESS

Moscow TRUD in Russian 27 Mar 86 p 2

[Article by Academician N. Fedorenko, member of the Presidium of the USSR Academy of Sciences (Moscow), under the rubric "Improve the Economic Mechanism" : "The Stimuli of Growth"]

[Text] In recent years in our country a number of very important decisions have been made in the area of the material stimulation of scientific and technical progress: the system of incentives of inventors and efficiency experts has been improved, the remuneration of the labor of scientists, designers, and process engineers is being improved. Some specific steps or others, which stimulate technical progress in machine building, power engineering, the agroindustrial complex, and consumer service, have been envisaged. But, unfortunately, some measures were of a half-hearted nature and proved to be inadequately worked out. Problems accumulated more rapidly than they were solved. As a result the prestige of engineering labor declined, the influx of capable young people to technical higher educational institutions decreased. In recent years this process, unfortunately, has also affected science.

It seems that the main cause of the arisen difficulties and failures consisted in the lack of a systems approach to the solution of the problem. The taken steps were uncoordinated and, no matter how paradoxical this sounds, too utilitarian and were aimed at specific highly specialized sections of the economy. We economists are also guilty here. It seemed to us that, by elaborating particular, specific suggestions on the improvement of some parts or others of the economic mechanism, we would be closer to practice and to real economic life. We forgot the noteworthy words of V.I. Lenin: "...whoever sets to work on special problems without the preliminary solution of general ones, inevitably at each step will unconsciously for himself 'stumble upon' these general problems. And to stumble upon them blindly in each specific case means to doom one's policy to the worst vacillations and unscrupulousness."

Strictly speaking, there are no special stimuli of technical progress, there is the general problem of improving the economic mechanism. And it should be adjusted in such a way that it would force the enterprise to adopt everything that is most new and advanced in the area of equipment and technology, because

otherwise it will lag and "go bankrupt." It seems that the main stimulus of progress, which is capable of creating an atmosphere of genuine receptivity to everything new and advanced, which was spoken about at the congress, lies in this.

Such an approach requires one, obviously, to examine in a fault-finding, critical manner the prevailing system of the financing of scientific and technical progress, the stimulation of people for specific scientific and technical achievements, and the support of the creative initiative of innovators. It is necessary to begin, it seems, with the plan, and first of all the long-range plan. In it not only should the goals--for example, the assimilation of a number of types of new equipment--be recorded, but the expenditures, including for the stimulation of the immediate performers of the work, which corresponds to the importance of each such goal, should also be envisaged. While for this the role of the Comprehensive Program of Scientific and Technical Progress of the country should first of all be increased.

What is the Comprehensive Program like at present? It is formulated every 5 years for the next 20-year period by large collectives of scientists and specialists, who know well the situation in science and technology, the real prospects, and the needs of development, and specifies the basic strategic directions of scientific and technical progress on the basis of the tasks which are posed by the party. But up to now the program has been merely a recommendatory document.

In undertaking the renovation of the national economy of the country, the party has in mind its substantial structural reorganization and the establishment of new and the latest sectors and works, which correspond to the world level of technology and, in a number of cases, also exceed it. In this work there is something for industry to rely on. For Soviet science has a mighty potential, which is capable of developing new technologies and models of equipment, which are unprecedented in their possibilities.

But the plans of production, the plans of construction, renovation, and retooling, and the measures on the improvement of the organizational structure should be closely coordinated with the plans of research and development. The transformation of the Comprehensive Program of Scientific and Technical Progress into a directive document would contribute to this. Because the priorities in the allocation of financial assets and material and manpower resources, as well as the system of the stimulation of workers and collectives should be specified at the stage of planning. This means, in particular, that it is necessary to allocate all these resources first of all and in the full amount to those enterprises, organizations, and institutes, which are developing truly new, highly efficient equipment.

Such an approach requires the utmost development of cost accounting and commodity-money relations and the broadening of the self-sufficiency and self-financing of associations, large enterprises, and other participants in the process of the development and use of new equipment and technology, which is unified in its essence. Only then, for example, will the construction organization or, say, the machine building association, which perform the role of the general contractor of new construction, not purchase an obsolete design

from an institute and obsolete technology from a scientific research laboratory. Then the kolkhoz will itself select the tractor or combine of the make, which is suited best of all to its natural conditions. But then both the designer and the planner will not work for the shelf, but will know precisely for whom they are developing their machine. They, after all, will also "go bankrupt," if they do not incorporate in their design what is truly best and advanced in the technical and economic respects.

But let us return to the problems of the material stimulation of progress. By allocating financial assets for the fulfillment of one specific scientific and technical program or another, the state, as we have said, could each time also envisage incentive funds for its successful implementation, which would be an integral component of these expenditures. This would conform to the principle: the incentive is for the specific end result in scientific and technical progress and the development of production.

This principle, in our opinion, should be pursued through the entire hierarchy--from the national economic and sectorial level to the enterprise and shop. The incentive can be both collective (the replenishment of the funds of associations and enterprises) and individual. As an example let us show how this principle could be implemented at the enterprise, at the sectorial scientific institute or laboratory, and at the design bureau. At present there exists a procedure, in conformity with which workers are paid bonuses for the fulfillment of individual themes in accordance with the results of the year and for other similar intermediate results. But it is necessary to give an incentive exclusively for the final product: the development of new equipment or technology, moreover, ones which are competitive on not only the domestic, but also the world market. It would be possible to organize the matter as follows: on the basis of the proposed economic impact of the equipment being developed, the amounts of the bonuses for the participants in the work are established. The money is transferred to an account at a savings bank or at the State Bank, but is issued only after the delivery and acceptance of the work in accordance with established procedure, with the confirmation of the economic impact, that is, not for the estimated, but for the actual, real national economic efficiency.

At scientific research and experimental design organizations the system of competitions must be used more actively, as has been done for a long time, for example, in the aircraft industry. A state order for new equipment is to be placed only with those enterprises and associations, which demonstrate that the item designed by them is better and more efficient than other domestic and, of course, foreign models. The same thing, of course, also applies to the selection of designs for the construction of new enterprises and the renovation of old ones. Here a competitive system, with unbiased extradepartmental appraisal and the corresponding incentive for the winners, is simply necessary. Some managers fear such parallelism and believe that this will lead to the excessive expenditure of assets. But in reality, we believe, the opposite will occur--given such an approach the expenditures will be recovered many times over by the efficiency which is achieved in the future.

Incidentally, the victory of enterprises and associations in the competition would become under these conditions the most prestigious form of the recognition of the scientific and technical maturity of the collectives, would enable superior organs to entrust to them the most difficult and honorable assignments, and would increase the influx of orders. And, hence, the conditions would be created for the increase of incentive funds and housing construction and the use of other forms of stimulation.

Much still has to be done for the increase of the responsibility for the assigned job and the improvement of the material stimulation of the specific performers--the managers of scientific institutions, specialists, and workers. The measures on the improvement of the remuneration of the labor of specialists so far have not confirmed their effectiveness to the extent that was expected. It is quite clear that the mechanical increase (moreover, not a very significant increase) of the wage of all engineers of enterprises does not solve the matter. It is also important here to strengthen the connection of the remuneration with the real end results and the specific contribution of the workers to the increase of production efficiency. Apparently, it makes sense to think about the establishment of specific advantages for the specialists of the most rapidly growing sectors and works, for example, such ones as microprocessor engineering, robot building, the development of flexible machine systems, or, say, polygraphy, which is based on new technological principles. Without this we will not be able to select and, what is the main thing, to train the necessary number of people for sectors of this sort.

Such are a few thoughts on the stimulation of scientific and technical progress, which were evoked by the study of the materials of the 27th CPSU Congress. Of course, the author does not consider them to be the only possible solutions. One thing is clear: the search for means of the better stimulation of scientific and technical progress lies in the direction of the general tasks of the improvement of the economic mechanism. In the Policy Report of the CPSU Central Committee to the 27th CPSU Congress it is stated: "We will not be able to accomplish the posed tasks on the acceleration of scientific and technical progress, if we do not find levers which guarantee priorities only for those research institutions and industrial enterprises, the collectives of which actively introduce everything new and advanced and seek means of the production of high-quality and efficient items." So let us seek together these levers and put them to use without delay.

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CSO: 1814/180

ROLE OF DESIGN IN IMPROVEMENT OF PRODUCT QUALITY

Moscow PRAVDA in Russian 25 Apr 86 p 2

[Article by engineers S. Brusin and N. Kharitonova (Moscow): "Design Is Not a Beauty Treatment, But a Reliable Means of Improving the Quality of Items"]

[Text] Is the appearance of a machine tool, a machine, a control panel attractive? Is it easy and convenient for a person to work? The developers of competitive equipment are worrying more and more about the development of design. Its strength is that it links things which, it would seem, are hard to combine--economics and ergonomics, technology and esthetics.

In the past 20 years a state system of design has formed in the country. Design subdivisions, the efforts of which are coordinated with the work of the Institute of Industrial Design (VNIITE), have been established in ministries and departments. Interesting developments have appeared. Nevertheless the situation with design cannot give satisfaction. As before, economic managers, when making serious decisions in a technical area, place their trust exclusively in engineering thought. On the world market the good design solution of industrial equipment is regarded as the second most important component of quality after reliability.

The designer sees better than others: what is uneconomical cannot be beautiful. Therefore, modern industrial design also proved to be in the front line in world production and in the campaign for economy. The original methods of research of designers and their ability to imagine a machine as an integral form lead at times to an unexpected decrease of the expenditures and materials. A classical example: specialists of the Institute of Industrial Design within the framework of the design program studied for the instrument makers more than 1,500 types of instruments. The wastefulness of unsystematic designing was established. The designers together with the engineers of the sector were able to develop a large number of unified design approaches: the range of control devices for instruments was reduced to one-fourth, the number of types of housings was decreased, the labor intensiveness of the production of load-carrying structures was reduced to one-fifth....

The broadest groups of plant specialists experience the need for the services of designers. For them this is an obvious means of increasing the standards of production and its technical level, since it is aimed at the same time at

the improvement of working conditions, the quality of labor, and product quality. The rail, against which a woman weaver leans in order to tie a broken thread, for decades was made of metal, that is, was rigid and cold--the designers of the Special Artistic Design Bureau of Light Machine Building (SKhKBlegmash) detected and eliminated this shortcoming. And how many similar "trifles" there are in different sectors of industry!

The development of design promises an appreciable return and requires relatively small expenditures--2-3 percent of the cost of design developments. At first glance they used this rather well: more than 1,500 design groups are working in the sectors of the national economy and in 330 large cities of the country. But the actual state of affairs cannot give satisfaction.

In most instances the design subdivision is one or two workers at a scientific research institute or design bureau, whose functions are far from artistic designing and are reduced at times to the filling out of technical specifications of various kinds. In essence it is possible to count on one's fingers the actively working design collectives such as, say, the Special Artistic Design Bureau of Light Machine Building.

What is getting in the way? No matter how paradoxical, the very principle of the organization of the labor of the designer. This work in the literal sense is aimed at the end result: How will the equipment being developed show its worth in contact with man in the process of operation? Alas, such a clear orientation does not interest everyone. The maximum efforts are still being expended in order to produce a product, but here there is little concern for the impact for the user. Thus unmarketable furniture and shoes, general-purpose machine tools of obsolete design...are appearing in enormous quantities.

Being oriented precisely toward the impact for the user, design conforms to one of the main principles of the development of a competitive product. Whoever does not have such an aspiration also does not have a need for design. In order, for example, to approve for introduction a new model of a frame for glasses, which has been proposed by designers (abroad this is a week's time), in our country it is necessary to obtain 66 signatures in 11 ministries and departments, on which about a year is spent.

Another eloquent example: the Klimovsk Plant of Textile Machine Building refuses to introduce the designer's plan of ATPR looms, which was made by the Special Artistic Design Bureau of Light Machine Building and received for the improvement of the working conditions of weavers a gold medal at the first international exhibition, Design-85. The substantiation of the refusal is discouraging: the looms, they say, are getting by well as it is.

The policy of the development of competitive equipment is affording great prospects for the development of design, but so far steps are not being taken to implement them. There is no system of the evaluation of the achievements of design labor. Design is not taken into account when submitting scientific and technical works even for the most prestigious prizes in our country.

"At conferences, at which decisions are made--from the ministry to the scientific research institute--they rarely mention design," Yu. Kuznetsov, chief engineer of the Special Artistic Design Bureau (SKhKBlegmash), says. "In the scientific and technical council of the Ministry of Machine Building for Light and Food Industry and Household Appliances in contrast to many other ministries a design section operated, but following the routine reorganization they eliminated it."

In our country the available forces of professional designers are very few. The analysis of the comprehensive programs of the USSR State Committee for Science and Technology for the 12th Five-Year Plan, which was made by the Institute of Industrial Design, revealed: designers should fully participate in at least 50 of them, they are actually participating in many fewer. The annual graduating class of certified artistic designers for the entire country is only 350. For comparison: the graduating class of architects is more than 5,000. The practical experience of the Ministry of Machine Building for Light and Food Industry and Household Appliances attests that there are not enough design forces even for the most important directions of technical research.

But meanwhile today not only artists, but also engineers of different types need a design education, if only in the principles. The visitors of international industrial exhibitions are not indifferent to the industrial design of some item, but it also never occurred to them that an artist was not enlisted here--it is simply customary to work with such quality among design engineers.

Unfortunately, by a decision of the Ministry of Higher and Secondary Specialized Education the short course in industrial design not that long ago was completely eliminated from the syllabus of 40 engineering higher educational institutions. They reason as follows: the course is inferior in content to a number of most important technical subjects, while the syllabus is supersaturated--hence, something has to be sacrificed. Alas, in such an explanation the cause was exchanged in places for the consequence. Industrial design is inadequately developed precisely because our engineering contingent is not relying on it in its work. As a result literally at every step one has occasion to encounter elementary ignorance of what design is capable of. It has as if fallen from the "big league" of scientific and technical progress.

Design becomes an important reserve of technical progress, when the artist takes part in technical research at its very first stages. In front of us is a convenient modern machine tool, which the operator controls by pushing a button--it seems possible to congratulate the designer on the success. But what is this? Nearby another worker is performing on his equipment awkward monotonous manual operations. Why did they not entrust the production section as a whole to the designer? Because it never occurred to anyone that he is capable of raising the entire machine complex to a level higher, although precisely the point of design lies in this.

Such situations are frequent. For example, specialists of the Special Artistic Design Bureau of Light Machine Building, after fully completing the order for the artistic design plan of equipment for the production of children's dairy products, only then learned that what they had done is only a

fragment of an entire line. Hence, the work is in vain: an order for a complex is needed, while for its individual part it does not make sense at all.

To give life to the design product is a part of the vital general problem of the introduction of the prototype in series production. Production workers for the present have not found here easy means, how do artists, who do not have powerful organizational levers, feel in this field? Some, having despaired of not working "for the basket," develop simultaneously two competitive designs for an order: a creative design, and another one--a primitive, but "passable" one. These anecdotal attempts merely overshadow the urgency of the problem.

The situation is similar to how 15-20 years ago under the conditions of the mass ignorance of clients computer methods of mathematics were introduced. The organization could acquire a computer and order for it one programming specialist, dooming him to an embarrassing existence: there were set for him problems which in principle do not require computations on a computer or even computations at all.

Often they give artists only orders for the modernization of the appearance of a product at the level of a beauty treatment. But the consequences are dismal. A serious specialist, without admitting that they are ordering him "to touch up and adjust," frequently leaves design altogether. Thus, while having a small detachment of designers for the country as a whole, the constant outflow from this sphere of the best forces is being permitted.

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INTERBRANCH COMPLEXES, BARRIERS TO INTRODUCTION OF IDEAS

Moscow ARGUMENTY I FAKTY in Russian No 14, Apr 86 pp 1-2

[Interview with Vladimir Petrovich Vashchenko, chief of the Scientific Organizational Administration of the USSR State Committee for Science and Technology, by ARGUMENTY I FAKTY correspondent A. Aliyev under the rubric "Science--Economics--Progress": "How Interdepartmental Barriers Are Being Eliminated"; date, place, and occasion not given; first paragraph is ARGUMENTY I FAKTY introduction]

[Text] In spite of the fact that much research, which is being conducted by scientists of our country, by right constitutes the pride of Soviet science and technology, in this area there are both difficulties and unsolved problems. The main one of them is the speeding up of the implementation of scientific and technical ideas and the shortening of the time of their passage from development to mass production. Our correspondent A. Aliyev talks with V. Vashchenko, chief of the Scientific Organizational Administration of the USSR State Committee for Science and Technology, about what has already been done in this direction and what still has to be done.

Correspondent. First of all, Vladimir Petrovich, could you tell how the barriers between science and production in our planned socialist economy appeared?

Vashchenko. I, honestly speaking, do not like the term "barriers." The feeling might emerge that in our country someone or something is specially resisting the introduction of scientific developments at the works. This is incorrect. Most likely, it is necessary to speak of the fact that for some time the activity of institutions and the interests of production were not coordinated.

Of course, a large number of promising technical solutions were developed, but, unfortunately, they did not always find their place at the works, including for the above-named reasons. At this it happened that we were forced to buy imported equipment which was produced in accordance with our technology which was sold at one time in accordance with licenses abroad.

There is another problem, which has arisen in recent times and also requires immediate solution. Today the most significant discoveries in science are

being made, as a rule, at the meeting point of different directions. And the use in practice of the results of scientific research also does not always fit within the framework of the traditional, sectorial organization of industry. The development of the latest directions of engineering and technology within the framework of the existing ministries, which are called upon to solve sectorial problems, at times is faced with certain difficulties.

But the advantages of our planned economy also consist in the fact that we not only see the "bottlenecks," but also have the opportunity to eliminate them. The planned nature of our national economy, which as before is being subjected to the fierce attacks of bourgeois ideologists, enables us to concentrate assets precisely where this is needed and to conduct extensive experiments in all fields of science and production.

The practical experience of our life has shown that intersectorial scientific and technical complexes (MNTK), which unite the efforts of academic institutes, planning and design organizations, and pilot industrial works, are the most successful form of the integration of science with production.

Not that long ago the CPSU Central Committee and the USSR Council of Ministers adopted the decree "On the Establishment of Interbranch Scientific and Technical Complexes and Measures on the Support of Their Activity." The assurance of the rapid evolution of scientific and technical developments at the world level and at a level surpassing it is the task of the intersectorial complexes.

They are established directly by the USSR Council of Ministers, work in accordance with 5-year and annual plans which are common to all the organizations which belong to the complex, and report back annually to the government.

Correspondent. What are these complexes?

Vashchenko. First of all 16 interbranch scientific and technical complexes have been formed. Scientific research, planning, and design organizations and pilot works belong to each of them. Engineering centers, the task of which is the preparation of the models of equipment, which are being developed, for mass production in many sectors, are also organized within the complexes.

The coordination of all the work being conducted in our country in the directions entrusted to them is assigned to the interbranch scientific and technical complexes, moreover, each complex should become simultaneously the bearer and coordinator of basic research and specific developments in accordance with the corresponding assignments of the Comprehensive Program of Scientific and Technical Progress of the CEMA Member Countries to 2000.

Correspondent. The gap between science and production did not form yesterday. Have ways of overcoming this gap been found? In short, was there some prototype for the interbranch scientific and technical complexes?

Vashchenko. Undoubtedly, these are both the Balashikha Kriogenmash Scientific Production Association and the Institute of Electric Welding imeni Ye.O. Paton

of the Ukrainian SSR Academy of Sciences. Design and technological bureaus, experimental works, and plants are united "under the roof" of this institute. Today, with the acquisition of the status of an intersectorial scientific and technical complex, the potential of the Institute imeni Ye.O. Paton is increasing due to several more scientific and production subdivisions of various ministries and departments.

Scientific and technical complexes began to be established in the early 1980's and acquired particular importance, from the standpoint of the solution of interbranch problems, after the June (1985) conference in the CPSU Central Committee on questions of the acceleration of scientific and technical progress.

Correspondent. What directions will be developed by the established interbranch complexes?

Vashchenko. The main criterion of the choice of a direction of the work of the interbranch scientific and technical complex is its promise for the development of the national economy. For example, the development of diagnostic means--various kinds of systems, sensors, and test stands, which make it possible to ensure the increase of the reliability of machines and components and the substantial decrease of the metal content--will be the task of the "Reliability of Machines" Interbranch Scientific and Technical Complex, which Vice President of the USSR Academy of Sciences Academician K. Frolov, director of the Institute of Machine Science of the USSR Academy of Sciences, heads.

Another direction is represented by the "Laser Technology" Complex. The previously established Scientific Research Center for Technical Lasers of the USSR Academy of Sciences, which has a good pilot works, became the main organization here. The most advanced laser robotized technological complexes for the machining of materials in many sectors of industry will be the final product of this association. Vice President of the USSR Academy of Sciences Academician Ye. Velikhov has been charged to head this work.

The "Personal Computers" Interbranch Scientific and Technical Complex, which is managed by Academician B. Naumov, will ensure the mass production of personal computers. The "Biogen" Complex is oriented toward the elaboration of the problems of biotechnology, the "Light Guide" Complex--fiber optics, the "Robot" Complex--robotized and flexible machine systems, the "Petroleum Production" Complex--an effective technology of stimulating productive petroleum reservoirs.

We have a folio of suggestions on the establishment of other intersectorial complexes. As you see, this is not an experiment, but a new stable form of the integration of science and production.

Correspondent. Are you not afraid that due to the close connection of science with production the role of basic research will decline to some extent? Will scientists not get carried away by the elaboration of only specific problems?

Vashchenko. The very structure of the intersectorial scientific and technical complex presumes at the basis of developments the use of the basic research which is being conducted by the main scientific research institutes which belong to the complexes.

It is possible to add that the shortening of the time of the use of various basic discoveries in practice is one of the factors of scientific and technical progress. Thus, nearly 20 years passed from the discovery of the principles of television communications to their extensive use, lasers covered their path in less than 10 years, while integrated circuits began to operate in 3 years. Therefore, we are well aware of all the importance of basic research and will devote increased attention to it.

Another feature of the intersectorial scientific and technical complexes, which are developing the most advanced directions of scientific and technical progress, is connected with this. They will in many respects determine the "social demand" for specialists of tomorrow. This work will be performed in close contact with the USSR Ministry of Higher and Secondary Specialized Education, which is obliged first of all to organize the training of students in accordance with the proposals of the intersectorial complexes.

Correspondent. Will it not happen that, by establishing "suprasectorial" interbranch scientific and technical complexes, we will merely complicate our state mechanism and will lengthen the chain between the highest executive organ--the USSR Council of Ministers--and the immediate performers?

Vashchenko. The interbranch scientific and technical complex is a level in the scientific, and not the state, hierarchy. The enterprises of different sectors are not changing over to dual subordination--their own ministries and the interbranch scientific and technical complex, but continue to fulfill their task. But the interaction of all the units of interbranch complexes is of a mandatory nature. The USSR State Planning Committee, USSR ministries and departments, and the councils of ministers of the union republics are charged to envisage when drafting 5-year and annual plans the extensive use in the national economy of the new types of equipment, technology, and materials, which have been developed by the interbranch scientific and technical complexes. Moreover, these will be experimental models, small series of machines, and nontraditional equipment and materials. At the same time industrial enterprises will begin to prepare for the output of series-produced products, if, of course, they have shown themselves to advantage during comprehensive tests.

We hope that, by relying on intersectorial scientific and technical complexes and adopting the achievements of sectorial ministries, it will be possible to use more completely the advantages of the planned system for the acceleration of the movement along the path of scientific and technical progress.

The dynamism which is inherent in socialism, if it is used properly, makes it possible to solve the most difficult economic problems, by relying on the

impressive scientific potential, properly organized planning, and the creative initiative of people. The organization of interbranch scientific and technical complexes is another example of this.

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CSO: 1814/212

PATON ON PROBLEMS OF FORMING INTERBRANCH COMPLEXES

Moscow EKONOMICHESKAYA GAZETA in Russian No 12, Mar 86 p 19

[Interview with Academician Boris Yevgenyevich Paton, director of the Institute of Electric Welding imeni Ye.O. Paton, by EKONOMICHESKAYA GAZETA correspondent V. Denisov under the rubric "Interbranch Scientific and Technical Complexes: Experience and Problems": "Beyond the Framework of Departmental Interests"; date, place, and occasion not given; first two paragraphs are EKONOMICHESKAYA GAZETA introduction]

[Text] The "Institute of Electric Welding imeni Ye.O. Paton" Intersectorial Scientific and Technical Complex is 1 of the 16, which were established at the end of last year and are oriented toward the performance of the entire cycle of operations on the development and the assimilation of the production of highly efficient types of equipment, technology, and materials.

In an interview with our correspondent V. Denisov, Academician B.Ye. Paton, director of the institute, tells about the problems of the formation of the new form of the integration of science and production.

[Question] Boris Yevgenyevich, it is well known that the establishment of interbranch scientific and technical complexes should serve the rapid solution of the most important interbranch problems of the acceleration of scientific and technical progress. How, in your opinion, will the new associations be able actually to influence the achievement of the set goal?

[Answer] The party regards the utmost acceleration of scientific and technical progress as a key political and economic task. In its accomplishment the role of the strengthening of the contact of science with production is great. Much attention was devoted to this question at the 27th congress in the Policy Report of the CPSU Central Committee.

It is planned to obtain not less than two-thirds of the increase of the productivity of national labor during the 12th Five-Year Plan by the use of the achievements of science and technology.

Under present conditions the development of such organizational forms of the integration of science, technology, and production, which, as is stated in the Basic Guidelines, "make it possible to ensure the efficient and rapid passage

of scientific ideas from conception to extensive application in practice," has become an urgent necessity. It is a question of combining in specific sections of scientific and technical progress different research, planning and design, and production subdivisions regardless of their departmental affiliation.

The possibility in practice of simultaneously conducting scientific research and developing new technologies, of simultaneously designing and producing prototypes of the most advanced equipment is ensured in the interbranch scientific and technical complexes which are being formed.

The interbranch scientific and technical complexes can and should sweep away the departmental barriers which have become the talk of the town. The uniting of various collectives under "one roof" of the interbranch scientific and technical complex and the management of the main organization with common annual and 5-year, so-called continuous plans, undoubtedly, will speed up the performance of the operations on the entire cycle--from the idea to the assimilation of new equipment.

[Question] Your institute in many respects served as a prototype of the interbranch scientific and technical complexes which are being formed. Tell us, please, in greater detail about the experience which has already been verified by practice.

[Answer] Over a number of years a specific scientific and technical complex with a strong design and technological bureau, an experimental works, and pilot plants was formed on the basis of the Institute of Electric Welding of the Ukrainian SSR Academy of Sciences. Quite ideal organizational forms, which withstood the test of time and are capable of becoming the core of interbranch scientific and technical complexes, emerged. One of them is the now widely known engineering centers, about which your newspaper has already written (No 35, 1985). Whereas the interbranch scientific and technical complex will solve the problems of new equipment and technology as a whole, the engineering centers will become the striking force in more narrow, specific directions. The interbranch complex is established not in a void: a reliable chain of the passage of a novelty from the stage of development to the production of a prototype has been developed here. For example, we needed a little more than 2 years for the development and introduction of the Sever Complex, which increases labor productivity by six- to eightfold when welding pipelines under the most difficult northern conditions of Siberia. While the process of the electroslag crucible smelting of metals and alloys, which was developed by the institute, in already a year was used at a number of enterprises as the basis of highly efficient low-waste technologies. Thus, the interbranch scientific and technical complex is capable already today of accomplishing the first part of the task assigned to it: to prepare scientific ideas completely for large-scale introduction.

We see two directions in the activity of the interbranch scientific and technical complex. First, we bring an idea up to a prototype and turn it over to a plant for series production. The second direction: we make the prototype here, but issue the technical specifications for it jointly with the manufacturing enterprise. Both directions shorten the time from the idea to

the series to 1 year. In both cases it is desirable to perform the work jointly with the plant collectives which are members of our interbranch scientific and technical complex.

[Question] What does the mechanism of the mutually advantageous relations of all the members of the interbranch scientific and technical complex seem like to you?

[Answer] In order to use more completely the potential of the interbranch scientific and technical complex, it is necessary to settle, and cardinally, the questions of supply and financing. These two basic items should be in the sphere of influence of the interbranch scientific and technical complex as the basis of the new economic mechanism, which it is necessary to reflect in the statute on complexes, which is now being drafted.

The question of supply is apparently settled. The interbranch scientific and technical complex will receive everything that it needs, as required.

But there are still many obstacles, including ones of an economic nature, in the way of the large-scale introduction of innovations. The question "To whom is this advantageous?" acquires different nuances depending on the specific situation.

There is, for example, the following development: a special coating, a kind of technological ring, is welded onto the valve plate of a motor vehicle engine. It increases by threefold the life of the scarce part. The advantage, it would seem, is obvious.

What happens in practice? The "seizure" of the innovation begins at the plant which produces the valves. The enterprise should reorganize its own production: it should deliver new equipment for the removal of chamfers, welding on, the finishing of the item, and so on. It is necessary to seek production areas, to train people--in short, there are innumerable problems.

Then the motor plant enters this process. It, in turn, should decide how to install these valves, how to bore the sleeves in a new way, to change the technology.... But what advantage does it get from this? None, the enterprises which will use the motor vehicle will get the entire advantage. The national economy as a whole will also be none the worse off. Less time and labor expenditures will go for repair.

The incentive of the enterprise for new equipment comes from the economic impact. But how is it to be calculated, if one motor vehicle operates in the frozen north and another in the hot south, the driver looks after one like a living being, in pursuit of the output does not let the other take a rest? The impact that was calculated in the laboratory is not taken into account, it is "theoretical," they do not pay money for it.

The interbranch scientific and technical complex is capable of settling this question independently. We are convinced that the stimulation of new equipment and technology should be perceptible, substantial, and, if it can be said this way, immediate, so that the enterprise would be interested

economically not in marking time, but in moving and moving ahead.

With what can the interbranch scientific and technical complex interest the producers? With limits for the new equipment which has come from within its walls. No one will refuse advanced and more economical technology. For the present the acquisition of equipment for it, as a rule, drags out for long months, or else years. The interbranch scientific and technical complex should have the possibility in a matter of days to fill the orders of producers from its own assets, having given in so doing skilled assistance in the new matter.

Moreover, the main organization should have the right to finance or to halt the financing of research and development at its own discretion.

The experience of our institute suggests that it is necessary to give the interbranch scientific and technical complex the real authority to specify the technical policy of any sector in the direction assigned to it. The new mechanism of stimulation for the production of highly efficient equipment, which was introduced this year, has not yet uttered its weighty opinion. For the present the situation is such that there are least interested in technical innovations those who should produce them in the necessary quantity.

The collective of the Kakhovka Plant of Electric Welding Equipment has assimilated the production of a new rail welding machine, which enjoys an enormous demand not only in our country, but also in other industrially developed countries. At the same time units, which do not conform even to the present first quality category, have been coming from the shops of the enterprise for 20 years.

Of course, the changeover to the duplication of the latest models does not always take place painlessly. The changeover of production often affects the stability of the indicators with all the consequences ensuing from this. Hence, too, the persistent reluctance of many managers to take on extra worries. There is not enough, they say, obsolete equipment as well. And, as they say, they are jumping at it.

At times the manufacturing enterprises hold an all-round defensive position even after the making of decisions on the production at them of new equipment. They resist not on a certain matter and argue not about the merits of the components and assemblies, with which, as they say, you will not find fault. Formal pretexts are sought inventively, with inspiration worthy of better application, in the maze of agreements. There was an instance when they "rolled up" the technical documentation merely on the grounds that the galley proofs of the drawings proved to be several millimeters wider than conventional galley proofs. As a result a development grows old and finally enters full-scale life frequently on the eve of its obsolescence.

The interbranch scientific and technical complex should receive the real right to trust and independence. Only then will it be able to set up the mass production of new equipment and new materials and, what is not less important, to update the conveyor annually. The reserve of the increase of production

capacities lies in the ruthless decrease of the production of obsolete equipment.

Recently the Collegium of the State Committee for Science and Technology examined the urgent tasks on the support of the activity of interbranch scientific and technical complexes and discussed one of the versions of the draft of the statute on interbranch scientific and technical complexes--the main document, on the basis of which all the work of the new organizations will be organized. Now the interbranch scientific and technical complex is a form which requires filling with a well thought out content of the economic and production relations.

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CSO: 1814/212

CATALYST INTERBRANCH SCIENTIFIC, TECHNICAL COMPLEX

Moscow EKONOMICHESKAYA GAZETA in Russian No 22, May 86 p 4

[Interview with Corresponding Member of the USSR Academy of Sciences Kirill Ilich Zamarayev, director of the Institute of Catalysis of the Siberian Department of the USSR Academy of Sciences and manager of the "Catalyst" Interbranch Scientific and Technical Complex, by EKONOMICHESKAYA GAZETA correspondent N. Manuylov under the rubric "A Topical Interview": "The Interbranch Scientific and Technical Complex: Steps of Formation"; date, place, and occasion not given; first paragraph is EKONOMICHESKAYA GAZETA introduction]

[Text] The "Catalyst" Interbranch Scientific and Technical Complex has been established on the basis of the Institute of Catalysis of the Siberian Department of the USSR Academy of Sciences. The manager of the interbranch scientific and technical complex--Corresponding Member of the USSR Academy of Sciences Kirill Ilich Zamarayev, director of the Institute of Catalysis--tells about the problems of the formation, the prospects of the work, and the first steps of the new formation in an interview with our correspondent N. Manuylov.

[Question] First of all, Kirill Ilich, tell us, please, about the scientific and technical direction on which the forces of your interbranch scientific and technical complex are being concentrated.

[Answer] In the chemical sectors of industry catalysis by right is considered a decisive factor of the acceleration of scientific and technical progress. Up to 80 (and among new ones, more than 90) percent of the products are being produced here with the use of catalytic processes. Motor fuels, sulfur acid, mineral fertilizers, synthetic rubber, polyethylene, polypropylene, complex fibers--all these are the products of catalysis.

Moreover, catalytic processes are penetrating more and more into power engineering, metallurgy, the food industry, and the solution of ecological problems. Finally, a good catalyst--this has already been demonstrated--is the basic means to waste-free chemical technologies.

The more the need appears for new, more efficient catalysts and catalytic processes, the more keenly the problem of their more rapid introduction makes itself felt. The barriers existing in its way are well known, and

departmentalism was the main one of them. We are also now feeling this especially keenly.

Back before the establishment of the interbranch scientific and technical complex they attempted to bring science closer to production in the literal sense of the word. The Special Design and Technical Bureau of Catalysts of the Ministry of the Chemical Industry, with which we have been working hand in hand for a number of years now, was organized in our immediate vicinity. In Omsk, where a large petrochemical complex is located, a department of our institute, which is aimed at the search for new catalysts and catalytic processes for the deepening of the refining of petroleum, was established. This department with the support of the Omsk Oblast Party Committee, the USSR Ministry of the Petroleum Refining and Petrochemical Industry, and the plant workers was formed into a subdivision which is capable of solving difficult practical problems at the meeting point of the branch and science. By the end of the five-year plan it is planned to build on the grounds of one of the plants pilot industrial lines for the production of catalysts. I believe that this experience of joint work with the branches will aid the more rapid formation of the "Catalyst" Interbranch Scientific and Technical Complex and the organization of its activity.

[Question] What is the structure of the "Catalyst" Interbranch Scientific and Technical Complex?

[Answer] The interbranch scientific and technical complex drew in 14 organizations of the Siberian Department of the USSR Academy of Sciences, the Ministry of the Chemical Industry, the USSR Ministry of the Petroleum Refining and Petrochemical Industry, the Ministry of Mineral Fertilizer Production, the Ministry of Chemical and Petroleum Machine Building, and the Ministry of Instrument Making, Automation Equipment, and Control Systems. Their geography is from Irkutsk Oblast in the eastern part to Smolensk Oblast in the western part of the country. It is difficult to unite the interests and forces of all the partners and to specify the program of joint actions.

Joint work on the plan for 1986 and the five-year plan, which are common for everyone, became the first and, apparently, only step for us. The annual plan was drafted, was submitted for the agreement of ministries and the USSR State Planning Committee, and was approved by the USSR State Committee for Science and Technology. It took in more than 70 specific items, which conclude with introduction or pilot industrial checking.

The charter of the interbranch scientific and technical complex is being prepared. For it is necessary to regulate the interactions among the representatives of various departments and thereby give the necessary organizational "rigidity" to the structure of the interbranch scientific and technical complex.

In spite of such a broad departmental conglomerate of the interbranch scientific and technical complex, we were also able to specify quite clearly the basic items of our common five-year plan. Among them are both the large-scale introduction of the catalysts, which were developed during the preceding five-year plan, and the development and bringing up to introduction or to

pilot industrial checking of a new generation of catalysts and new processes based on them.

[Question] Name, please, the most interesting, in your opinion, innovations.

[Answer] Let us take from the joint plan only two items--the catalyst for obtaining sulfuric acid, which was developed by our institute jointly with organizations of the Ministry of Mineral Fertilizer Production, and the series of catalysts for the polymerization of ethylene and propylene (a joint development with organizations of the Ministry of the Chemical Industry). The former is being introduced already this year at 33 enterprises of various sectors. The latter should be introduced during this five-year plan at four large combines.

I will stress--this is no longer the good wish of the developers about introduction, not "a plan of agreements" of ministries, but a real plan of specific introduction, on which agreement has been gotten from everyone.

I have already mentioned that a significant number of new catalysts should in accordance with the plan undergo pilot or pilot industrial checking during this five-year plan. This is the bulk of the developments of the new generation of catalysts, and it is very important that already today within the interbranch scientific and technical complex it has been possible to bring them up precisely to this stage. For years--I am not exaggerating!--we incurred the most appreciable costs at this stage. It is no secret that there exists the "tradition," when in case of the making up of the plans the pilot plants end up there in last place, the financial remains, as a rule, are allocated to them. A number of developments, which have now been included in the plan of the interbranch scientific and technical complex, for several years simply could not under various pretexts get into the state plan and branch plans or statewide programs.

Now the attitude toward them has changed. The importance of each of them was determined not by one individual institute or another from its standpoint, not by the ministry separately, but jointly with representatives of the different organizations and ministries in the interbranch scientific and technical complex. Resources appeared for them, they have already been attached to specific addresses of introduction. But, of course, much again will depend on how we adjust the mechanism of the interrelations of all the participants in the complex. For the different departmental subordination of the partners in the interbranch scientific and technical complex is being retained.

[Question] Are there already specific suggestions?

[Answer] Yes, there are. We imagine (and our suggestions are receiving support) that in each sector one of the deputy ministers should be in charge of the work of the organizations within the interbranch scientific and technical complex, while among the organizations of the ministry one should be appointed the main one for the problem of catalysts in the sector as a whole. In turn, at the Institute of Catalysis one of the deputy directors is personally responsible for the progress of the work with each specific ministry.

At the same time as this the main organization of the interbranch scientific and technical complex in case of interrelations with the partners should have specific rights and clear financial and economic levers. For example, limits for construction, the right to influence the partners in case of their nonfulfillment of the obligations, financial means to give incentives for initiative and research.

A special centralized fund of the interbranch scientific and technical complex, which is formed from deductions of the ministries in proportion to the value of the output produced by them with the aid of catalysis, could, in our opinion, solve these problems.

How is this fund to be created? We have two suggestions. This fund, including small limits for the construction of pilot and pilot industrial plants, can be turned over entirely to the interbranch scientific and technical complex or be held in reserve in the ministries on the condition that its use should take place without fail in consultation with the interbranch scientific and technical complex. It is a matter here not of the desire to become the holder and manager of such an amount. It is simply that, in our conviction, the interbranch scientific and technical complex, not being restricted by the department approach, will be able to approach more objectively the distribution of these assets in the interests of the entire national economy and to spend them first of all on priority operations. For at the end of the five-year plan they will hold all of us accountable for the plan, while for this it is necessary to find the versions of the allocation of rights and duties, which are optimal for work.

On the basis of the specific nature of our interbranch scientific and technical complex, we regard as advisable the establishment of multiple-skill scientific production brigades. It is possible to call these collectives by a different name--this is not the issue. But the fact that specialists of science, the design bureaus, pilot works, and enterprises, for which the development is being prepared, should be included in them, is unquestionable.

For such a collective there should be a stage-by-stage plan of work and a system of incentives and stimulation which is uniform for all organizations. For each of the members of such a collective receives a wage and bonuses in his own department. The condition that the bulk of the bonus is paid only after the completion of all the work, should become mandatory. It is very important that the mechanism of stimulation for work in accordance with the plans of the interbranch scientific and technical complex would not be departmental.

I will cite a specific example of the efficient, in our opinion, organization of work. In the plan of the interbranch scientific and technical complex there is an item on the determination of the methods of obtaining a number of valuable products from natural gas and coal in terms of so-called synthesis gas. The entire national economy needs these products, but the immediate responsibility for the solution of the problem of obtaining them from synthesis gas has been assigned to the USSR Ministry of the Petroleum Refining and Petrochemical Industry. Good catalysts have been developed at our

institute. Near us in the already mentioned Special Design and Technological Bureau of Catalysts, but...of the Ministry of the Chemical Industry, which is not formally responsible for this problem. With whom are scientists to work? With whom are production workers to cooperate?

Logic suggests the most practicable means: it is most correct jointly with the Special Design and Technological Bureau of Catalysts to develop the production technology on a pilot industrial scale, to test the catalysts at enterprises of the USSR Ministry of the Petroleum Refining and Petrochemical Industry and the Ministry of the Gas Industry, which is also interested in this development, and then to assimilate their production and the catalytic processes of obtaining the necessary substances from synthesis gas at the enterprises of all interested ministries. Precisely such an interbranch collective, about which I have spoke, can perform most quickly this entire chain--from development to production. Moreover, it, so it seems to us, conforms most completely to the tasks which face the interbranch scientific and technical complex as a whole.

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PROBLEMS IN FORMING TECHNOLOGICAL LASERS COMPLEX

Moscow IZVESTIYA in Russian 16 May 86 p 2

[Interview with Galym Abilsiitovich Abilsiitov, director of the Scientific Research Center for Technological Lasers of the USSR Academy of Sciences (NITsTLAN), the main organization of the "Technological Lasers" Intersectorial Scientific and Technical Complex, by Kim Smirnov: "In Accordance With the Old Arrangements. What Is Hindering the Formation of the 'Technological Lasers' Complex"; date, place, and occasion not given; first paragraph is IZVESTIYA introduction; capitalized passages published in boldface]

[Text] It is necessary to build the bridges between science and the economy from both directions. Interbranch scientific and technical complexes (MNTK), the establishment of which was endorsed by the 27th party congress, serve as precisely such a link. IZVESTIYA has told about the formation of this new form of the acceleration of scientific and technical progress and about the difficulties, with which interbranch scientific and technical complexes are faced during their origination (No 351, 1985; Nos 107 and 110, 1986). Today the person we are talking to is Galym Abilsiitovich Abilsiitov, director of the Scientific Research Center for Technological Lasers of the USSR Academy of Sciences (NITsTLAN), the main organization of the "Technological Lasers" Complex.

[Question] We are lagging seriously with the extensive industrial introduction of technological lasers. What tasks in this connection are being assigned to your intersectorial scientific and technical complex?

[Answer] We are setting for ourselves a very strenuous, but practicable task: by the end of the five-year plan to ensure the industrial production of hundreds of laser units with a power of 1 kilowatt and more (in the future production will increase). They will be used first of all in the machining of materials in machine building.

Does this solve the problem of the establishment of the laser industry? It does not. The country needs not hundreds, but thousands, tens of thousands of technological lasers which operate over a wide range--this concerns both their power and their work occupations. As is evident, not a single laser intersectorial scientific and technical complex is necessary.

But our interbranch scientific and technical complex (it, incidentally, is of dual subordination--to the USSR Academy of Sciences and the Ministry of the Electrical Equipment Industry) hopes to make its contribution to the solution of the problem. This will happen, however, only if the interbranch scientific and technical complex is established by revolutionary, dynamic methods. Otherwise everything will wallow in evasive paragraphs, rubber-stamp amendments, consultations, and so on. This is a difficult path. So many innovations have floundered on it.

In reality, when it is a matter of the advancement of something new into life, it is impossible to solve anything without the serious organization precisely of WORK. Without the formation of a collective which is capable of nonstandard solutions. Without its provision with the necessary material base.

The last question for complexes as a whole and for their main organizations is the decisive, key one. For a strange trend has now come into view: How is one to establish interbranch scientific and technical complexes only on paper, without investing anything in them, without a base, merely by rearranging in a certain way the old "cubes" and not adding new ones? But, as Vice President of the USSR Academy of Sciences K.V. Frolov correctly noted in IZVESTIYA precisely in this regard, "nothing comes of nothing." I understand that the problem is difficult. But it is must be solved. And first of all the USSR State Planning Committee and the USSR State Committee for Material and Technical Supply must solve it.

[Question] What does the organization of your complex appear like to you?

[Answer] Links which support the entire chain from basic science to industrial production: an academic institute, a branch scientific research institute, a special design bureau, a pilot and a series-producing plant, are needed in it.

The first one is already represented by the main organization--the Scientific Research Center for Technological Lasers of the USSR Academy of Sciences. What about branch science? A new institute, which will deal with laser technological equipment, has to be organized here. Moreover, the departments of two leading institutes of the Ministry of the Electrical Equipment Industry--the All-Union Scientific Research Institute of Electrothermal Equipment and the All-Union Scientific Research Institute of Electric Welding Equipment--will have to be completely specialized in our themes. For the present there is no special design bureau. We will also establish it anew.

The Moscow Plant of Electrothermal Equipment, which it is necessary in a short time to free from the output of the current products and to reorient toward the production of elements and items of laser technology, will be the pilot enterprise. Such a decision has been made by the ministry. But it is extremely important that the renovation would not be disrupted by the slowness of the construction workers. The Tbilisi Elektrosvarka Plant will become the series-producing enterprise. Here new production capacities also have to be developed and the existing production capacities have to be reorganized.

Such an organization of the interbranch scientific and technical complex is necessary, since only it can completely join all the research and production collectives which belong to it by a common ultimate goal.

The party is summoning us from the energy of ideas to the energy of actions. But some economic managers now like to make noise in words about this transition. But in practice during the formation of an interbranch scientific and technical complex this transition occurs with a big crunch.

[Question] The "Technological Lasers" Complex is a complex of dual subordination. Does this not lead to the lack of one-man management and of a unified technical and technological policy?

[Answer] The idea of complexes is aimed both at the closing of the circuit, over which new equipment moves from basic development to production, and at the surmounting of departmental ambitions.

Departmentalism in our country has become all but a swearword. But the branch principle in case of the output of series-produced products has its own indisputable advantages. Hence, it is necessary to seek a solution, which ties together both these principles (the former is profound research at interdepartmental meeting points, which revolutionizes production) and overcomes their drawbacks. In the search for such a solution we come to the complex of dual subordination. In it the scientific organizations and enterprises, which belong to different departments, retain all the advantages of their branch affiliation and at the same time can solve in concert interbranch problems. One-man management and a unified scientific and technical policy are ensured by the fact that both the academy and the ministry act only through the management of the complex.

[Question] One-man management in case of dual subordination? It is a fine play on words....

[Answer] It will remain only a play on words, if three conditions, which, in my opinion, are necessary for the normal life and operation of the scientific and technical complex, are not rigorously implemented.

The first is the operation of the entire interbranch scientific and technical complex is accordance with a unified, in a sense the ONLY plan, and not a common plan. In the decision on complexes it is stated that the interbranch scientific and technical complexes operate on the basis of unified plans, which are agreed on by the USSR Academy of Sciences and the USSR State Planning Committee and are approved by the USSR State Committee for Science and Technology. But what meaning is incorporated at times in practice in the word "unified"? Unified means common. Given such an approach there appears, for example, an organization which plans only a portion of its work on laser themes. This part is derived from its common plan and is carried over mechanically to another common plan, now the common plan of the work of the interbranch scientific and technical complexes.

It would be, apparently, correct to understand the unified plan for the interbranch scientific and technical complex in a different way. As a tool

for the achievement of a unified goal. As the formation and regulation of common actions. And in this case this is the ONLY plan, in which all the work of all the organizations belonging to the complex should be entirely and completely reflected.

The second condition is that the manpower, financial, and material resources are calculated for the unified plan, and they are specially allocated to the interbranch scientific and technical complex. In our case the Ministry of the Electrical Equipment Industry and the USSR Academy of Sciences will allocate them--each to its own unit. But within the scientific and technical complex it should itself accept these resources and dispose of them. Here, when it is a question of construction, it is necessary that the USSR State Planning Committee would place the complexes on one of its priority lists. In those instances when for some reasons the planned supply of the complexes is disrupted, it is important to envisage for them the allocation of additional resources from the state reserves.

Finally, the third condition: the leading development of the main organization. For the entire edifice of the complex is built on its potentials, especially during the period of formation.

[Question] But are there not also appearing here your "departmental" interests--the fear of dispersing the potential of the academic laser center, which is already real and operating, in a scientific and technical complex, which does not yet exist and which it is still necessary to organize?

[Answer] Indeed, I am afraid of this. Several scientific and technical complexes are confining themselves to the production of prototypes. Such an approach is also legitimized by the procedural instructions of the State Committee for Science and Technology. I regard as correct our going beyond a pilot series. However, it raises the question of the new role of the main organization.

Here is a specific example. Special optics is equally necessary in order to produce both a prototype and an industrial series of technological lasers. For the production of prototypes we have within the center such a works. Moreover, it is capable of supporting not only the directions of our work, which emerge in industry, but also the research directions. However, when it is necessary to produce not a handful, but hundreds of technological lasers, the danger of stripping the entire scientific rear of the academic laser center arises, if the necessary capacities are not developed in good time in industry.

So that the danger of losing quality, of course, exists. In order to avoid this, the main organization will need a new safety margin and the drastic expansion of its production capacities. Unfortunately, this is obvious not always and not to everyone.

[Question] Is is a matter of the development of your scientific experimental and pilot production base in Shatura which was opened on the eve of the 27th CPSU Congress?

[Answer] Yes, I have it in mind first of all. But it is a matter not only of the production engineering potential, the element base, automation equipment, electronics, and laser optics. It is a paradox: while taking advanced positions in this respect, we essentially do not have the necessary means for the social development of the collective. For example, in Shatura the construction of our microrayon in practice has not been started. And this means that the production base will be developed more slowly due to the impossibility of attracting the necessary personnel.

Already today the gap between scientific production and housing construction is intolerably great (and for the present it is merely increasing). The Ministry of Power and Electrification is the general contractor of the Scientific Research Center for Technological Lasers of the USSR Academy of Sciences. The repeated appeals to its managers remain ineffectual. According to the plan the construction of a young people's housing complex should be started this year in Shatura. But when adjusting the plans they eliminated it from the title sheet. The construction organizations of Moscow Oblast also acted in accordance with the same scenario. The Moscow Oblast Party Committee entrusted to them the construction in Shatura of a young people's dormitory made of prefabricated components. But the construction workers also found here a formal excuse not to begin the work this year. And again the adjustment of the plans was used.

I believe that in both cases the question should be settled immediately, the projects should be included in the title sheets, and the work should be started this year.

Probably all the interbranch scientific and technical complexes, especially the ones which are being established on a new base, are faced with similar problems. And here it is important how the local organs of soviet power are helping to solve them. It would be correct that they would be directly responsible for the social development of the complexes and that decisions which do away with the bureaucratic fences would be adopted with respect to each interbranch scientific and technical complex with the participation of the ministries. For this is the starting point for any interbranch scientific and technical complex, without the attaining of which it simply will not be able to "breathe."

From the State Committee for Science and Technology, to which the procedural supervision of the complexes has been assigned, I would like to obtain not only recommendations on how the complex should be organized, but also assistance in its practical organization--from prompt responses to our suggestions to the settlement of controversial questions. The danger about which several scientists have spoken--lest the very creation of interbranch scientific and technical complexes would turn into a piece of paper--is, unfortunately, real.

The interaction of the academy and the ministry is settling the basic questions. But not all of them. And in those instances, when there is no unified point of view or when greater powers are needed, the promptness and weightiness of the decision should be ensured under all conditions, if we want

to act, and not to copy circulars and agreements. It is impossible to tolerate the delay in the formation of complexes. We do not have the right to do this in face of the colossal tasks which were set by the party congress.

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JOINT INSTITUTE FOR NUCLEAR RESEARCH

Moscow KRASNAYA ZVEZDA in Russian 15 Mar 86 p 4

[Interview with Hero of Socialist Labor Academician Georgiy Nikolayevich Flerov, director of the Laboratory of Nuclear Reactions of the Joint Institute for Nuclear Research, by KRASNAYA ZVEZDA stringer Ye. Molchanov (Dubna): "The Accurate Shots of the 'Ion Gun'"; date and occasion not given; first two paragraphs are KRASNAYA ZVEZDA introduction]

[Text] Never yet has the role of science been so great and so responsible as today, it was noted at the 27th CPSU Congress. At present the front line of the campaign for scientific and technical progress passes precisely through science. Precisely science is called upon to express its decisive opinion in the fulfillment of the tasks posed by the party on speeding up the pace of the socioeconomic development of the country.

The Joint Institute of Nuclear Research (OIYaI), the international scientific center of the socialist countries in Dubna, is preparing to celebrate its 30th anniversary. Here various directions of modern physics are being successfully developed, while the results of basic research are obtaining a broad outlet into practice. Hero of Socialist Labor Academician Georgiy Nikolayevich Flerov, director of the Laboratory of Nuclear Reactions, tells about one such operation in an interview with newspaper stringer Ye. Molchanov.

Every new thing originates where fountains of advanced and daring ideas play. And this is not an aphorism. Scientific and technical progress is the practicality of theoretical research and at the same time the fundamentality of applied development. At present no doubts about the close connection between basic and applied research are arising for anyone. They proceed not separately and not in themselves, but by relying on each other and mutually enriching each other.

"Geologists, biologists, and geochemists often turn to us in Dubna, at the Joint Institute of Nuclear Research with their problems," Academician Georgiy Nikolayevich Flerov says. "And they are beginning to respect science more and more in mining pits, shafts, and geological parties. While our staff members are going to experienced workers, are consulting them and are demonstrating 'in the field' the advantages of our methods. Specialists of the socialist member countries of the Joint Institute for Nuclear Research are treating our

applied operations with great interest, and here much also depends on the purposefulness of research...."

"The idea of using heavy ions for the production of filter materials has found extensive application in the most unexpected areas of science, industry, medicine, and even agriculture. The principle of obtaining such filters is quite simple. A heavy ion--this very small particle of matter--acts as a microprojectile which destroys the molecules of a polymer. The beams of ions are obtained on a U-300 accelerator. A polymer film, which is fed by a special tape-winding mechanism, is irradiated by the shots of the 'ion gun.' The process of destroying the molecules is continued under the effect of ultraviolet rays and is completed in an alkaline solution, in which the tracks of the heavy ions are finally etched.

"The diameter of the cells of the 'nuclear screen' depends on the type and energy of the ions, the properties of the material being irradiated, and the conditions of etching. When selecting the mode of operation of the 'ion gun,' it is possible to obtain filters with an apportioned number of pores (up to 1 billion per square centimeter) of a strictly specified size. The 'nuclear screen' is a practically ideal filter. It is distinguished from the best microfilters by the fact that it has regular round holes of identical diameter and can reliably separate even objects which are close in size--for example, a bacterium from a virus of different types.

"Here is just one example. A group of specialists was awarded the Prize of the USSR Council of Ministers in science and technology for the development of a new type of vaccine against tick-borne encephalitis. The compound has an increased immunological effectiveness, and a great service of the physicists of Dubna lies in this. In what does it lie?

"As is known, every antiviral vaccine contains many foreign bodies, in particular, protein. It is possible to separate it from viruses only by means of very fine filters with microscopic pores. Filtering devices with a diameter of 0.05 micron are used for the purification of a uniform viral vaccine. Compare: the thickness of a human hair is about 30 microns, that is, 600-fold greater.

"The filters developed in Dubna proved to be ideal and irreplaceable not only in case of the production of vaccines. They are finding extensive application in the electronics industry in case of the production of complex integrated circuits, in which tens of thousands of 'parts' are placed on an area of several square millimeters. The getting of a single speck of dust or even a bacterium into such a miniature device leads to spoilage.

"By means of the 'nuclear screen' it is possible to analyze the nature of the polluted environment. Particles, the sizes of which exceed the diameter of the pores, remain on the surface of the filter. Having installed membranes with different diameters of the holes, it is possible to 'sift' the impurities, which are contained in the air or water, into two groups. The rest, as they say, is the work of the equipment.

"Nuclear filters have found extensive application in the food industry: they sterilize gases and fluids, trapping any microbes. Such cold sterilization makes it possible to obtain high-quality food products (for example, milk, juices, other beverages), the keeping capacity of which is increased by many fold.

"In the microbiological industry it is possible to use cold sterilization in the production of antibiotics. With the aid of nuclear filters medical personnel are studying the sizes and form of various types of blood cells, are separating cancerous cells from it, and are studying the possibility of using nuclear membranes for blood separation. 'Nuclear screens' are also irreplaceable in microbiological technology.

"The 'heavy ion industry' is experiencing at present such rapid development that it is difficult to keep track of its new developments. The uniting of the efforts of physicists with specialists of other directions would promote the substantial progress of this work. For many tens of organizations--scientific and production--are interested in filter materials of this sort."

Nearly half a century ago the friends of his youth called Georgiy Nikolayevich, a young student at the time of I.V. Kurchatov, "multivalent Flerov." With the years this humorous attribute became a synonym of the versatility of the creative work of the researcher. And the fact that "Flerov filters" were made precisely in Dubna, is the service of the academician and his students.

"We should today pose very pointedly the question of increasing the yield of the labor of the scientist," Georgiy Nikolayevich said in conclusion of our interview. "The decisions of the 27th CPSU Congress aim us at this."

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POLYMER-BASED LUBRICANT-COOLANT FOR TOOLS

Moscow NTR: PROBLEMY I RESHENIYA in Russian No 5, 4-17 Mar 86 p 6

[Article under the rubric "The State Committee for Inventions and Discoveries Recommends": "300,000 Rubles a Year"]

[Text] Such is the economic impact which was obtained just at the Elektrostaltyazhmash Production Association from the use of the new fluid MKhO-60, which was developed on the basis of two inventions (Inventor's Certificates Nos 896059 and 667582), the use of which is radically changing the situation in metal working.

It is a familiar matter: the cutting tool "took off," the cutter broke, the drill became dull.... Sooner or later any tool fails.

It turns out that it is possible to lengthen the life of a tool. Scientists of Lvov Polytechnical Institute led by Professor A. Soshko, chief of the Chair of the Technology of Processing Plastics, proposed to add to the traditional lubricant-coolant ET-2 finely dispersed polyethylene powder. Thus the new fluid MKhO-60 originated.

In the cutting zone a polymer under the effect of high temperatures and pressure decomposes. By means of this the friction between the tool and the surface being machined is reduced.

The tests of the new lubricant-coolant at the ZIL, Uralmash, and Elektrostaltyazhmash Associations showed excellent results: the strength of the tool is increased by two- to threefold, the possibility of increasing the speed of cutting and at the same time the surface finish class appears.

All this has been well known for 6 years now. And the correspondence between the scientists of the higher educational institution, the Ministry of Heavy and Transport Machine Building, the Ministry of the Petroleum Refining and Petrochemical Industry, and the State Committee for Science and Technology has been going on for the same amount of time. But so far the simple, but extremely effective fluid has been used in a small quantity only at a few enterprises.

Meanwhile a new MKhO lubricant is already being tested at the Elektrostal Electrometallurgical Plant. By means of it the speed of the drawing of wire has been increased by several fold. The new lubricant is also suitable, in the opinion of the developers, in case of exploratory drilling. Tests have shown that the rate of sinking can be increased by twofold.

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USE OF PHENOMENON OF EJECTION IN PROPULSION SYSTEMS

Moscow SOTSIALISTICHESKAYA INDUSTRIYA in Russian 21 Mar 86 p 2

[Article by N. Ilinskaya: "Discovery No 314 Has Been Registered"]

[Text] Scientists of the Moscow Aviation Institute imeni S. Ordzhonikidze have made a scientific discovery, which is helping to understand more thoroughly the intricate mechanism of gas dynamics. The results of their basic research were entered on 20 March in the USSR State Register of Discoveries under No 314.

The phenomenon of ejection--the transfer of energy from an active high-pressure stream to an additional mass--is well known in nature, and engineers are using it extensively in equipment. Scientists are also studying quite actively the possibilities of using ejection for increasing the thrust of a jet engine. However, in the conducted experiments, both in our country and abroad, the anticipated effect either did not occur or was quantitatively very negligible.

Further experiments revealed the reason: the small magnitudes of the increase of thrust were explained by large internal losses which occur in the ejection duct.

The Soviet scientists--Academician V. Chelomey and Doctors of Technical Sciences O. Kudrin and A. Kvasnikov--were able to eliminate this obstacle. They detected the phenomenon of an abnormally great increase of the reactive force, which occurs under specific conditions--in case of the ejection of free air in a pulsating active stream. Up to 120-140 percent of the initial thrust was additionally obtained in the experiments.

The discovery is of great scientific and applied importance. Its practical application makes it possible to increase the efficiency of the operation of many technical devices, including jet engines, gas turbine units, and several types of industrial ejectors. This is the third scientific achievement of scientists of the Moscow Aviation Institute, which has been registered in the USSR State Register of Discoveries.

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SIMILARITY OF LANTHANIDES, ACTINIDES CONFIRMED

Moscow IZVESTIYA in Russian 11 Apr 86 p 2

[Article by I. Novodvorskiy under the rubric "Discoveries of Our Times": "At the End of the Periodic Table"]

[Text] On 10 April 1986 the USSR State Committee for Inventions and Discoveries registered the discovery which was made at the Institute of Physical Chemistry of the USSR Academy of Sciences by Academician V. Spitsyn, Doctors of Chemical Sciences N. Mikheyev and G. Ionova, and Candidate of Chemical Sciences L. Auerman, as well as at the Moscow Institute of Steel and Alloys by Doctor of Technical Sciences B. Korshunov.

Lanthanides and actinides are two groups of very interesting metals. Lanthanides--"rare earths"--have been known to man for not more than a century, while were obtained in pure form 30-40 years ago. However, they are used extensively in laser engineering, optics, and chemical technology as catalysts. Actinides are located at the end of the periodic table. They are all radioactive, the majority were obtained by artificial means. The areas of their application are well known: first, nuclear power engineering, which is inconceivable without uranium, plutonium, and thorium, and, moreover, many actinides, especially californium, are sources of the radioactive radiation which is used for medical purpose, for geological prospecting, and in many other fields of science and industry. These two groups of metals have interested scientists for a long time. At one time American physicist G. Seaborg voiced the idea of the similarity of the families of lanthanides and actinides, proposing in this case their paired analogy, that is, the similarity of the corresponding elements of both families.

The authors of the discovery checked this hypothesis, and it turned out that a paired analogy does exist, but not such an analogy as Seaborg imagined it. By studying the oxidation of lanthanides and actinides, they detected a similarity of the first half of the group of lanthanides and the second half of the group of actinides.

The discovery is of great importance for the study of the properties of rare metals, especially actinides and the elements following them of the end of the periodic table, which so far have not been obtained in sufficient quantities for experiments. Moreover, a number of inventions, which involve the

separation of actinides and lanthanides, were made on the basis of the discovery. They are of practical value for technology and are protected by inventor's certificates.

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ANNUAL GENERAL ASSEMBLY OF BELORUSSIAN ACADEMY OF SCIENCES

Minsk SOVETSKAYA BELORUSSIYA in Russian 12 Apr 86 p 3

[Article (BELTA): "Science: The Time of Acceleration. From the Session of the Annual General Assembly of the Belorussian SSR Academy of Sciences"]

[Text] The acceleration of the socioeconomic development of the country is inconceivable without the fundamental reorganization of the activity of institutions of science and without the convergence of the interests of research and production. Such is the main idea of all the statements at the session of the annual General Assembly of the Belorussian SSR Academy of Sciences, which was held in Minsk.

Academician N.A. Borisevich, president of the republic Academy of Sciences, in the report announced that the scientists of the academy during the 11th Five-Year Plan had completed basic research on 423 themes in the area of the social, natural, and technical sciences and had fulfilled assignments on 37 union and 36 republic scientific and technical programs. The amount of economic contractual operations--about 43 million rubles--is also significant. In all 1,455 developments were introduced in the national economy with a total economic impact of 786 million rubles.

When drafting the plans of research and experimental design operations for the 12th Five-Year Plan foremost attention was also devoted to basic research, which has a technical and technological orientation, and to the concentration of forces and assets in such priority directions as machine building, automation, electronics, and biotechnology. Here the scientific support of the acceleration of the development of the national economy of the republic and regional problems were specified as the most important task.

During the current five-year plan the academy plans to participate in 28 of the 39 republic scientific and technical programs. For their implementation 1.5-fold more researchers will be enlisted than during the 11th Five-Year Plan, the amounts of financing in this area will increase by twofold.

During the past five-year plan the economic impact from the introduction of the developments of scientists in production increased as compared with the same preceding period by 2.3-fold.

The USSR State Planning Committee has adopted a decision on the inclusion of 13 developments of the academy in the State Plan of USSR Economic and Social Development for 1986-1990 for assimilation and introduction and has charged ministries and departments to include 25 developments in the sectorial plans. These are rather good results.

But experience shows, N.A. Borisevich stressed, that it is necessary to provide with scientific accompaniment and to keep constantly under control even the operations which have been included in the state plan and sectorial plans. Only in this way is it possible to obtain the maximum impact. The institutes should already at the stage of research establish close relations with ministries and conduct applied and experimental design development in close contact with their scientific research institutes.

The Belorussian SSR Academy of Sciences was correctly criticized, the speaker said, for the inadequate contribution directly to the acceleration of the development of the national economy of the republic. Some changes for the better already exist. During the past five-year plan, for example, the economic impact, which was obtained from the introduction of academic developments in Belorussia, as compared with the preceding five-year plan increased by nearly 2.5-fold and came to 200 million rubles. These figures could also have been higher, but for the present the return from the developments of the institutes of mathematics, physics, heat and mass transfer, and applied physics, which are being introduced in the republic, is still low.

The task of increasing the amount of economic contractual work with enterprises and organizations of the republic and of increasing it in 1990 to 30 percent of the total volume of economic contracts being fulfilled by the Belorussian SSR Academy of Sciences was set for the Academy of Sciences. Since introduction is being carried out for the most part precisely in accordance with such a theme, the bureau of the presidium recommended to the institutes to solve promptly the arising problems, up to the going of working groups to organizations and enterprises of the republic. But several institutes treated this matter without proper responsibility. For the present the Institute of Solid-State and Semiconductor Physics, the Physical Technical Institute, and the institutes of technical cybernetics, the mechanics of metal polymer systems, applied physics, experimental botany, and genetics and cytology do not have enough economic contracts, while the institutes of bioorganic chemistry and biochemistry for the present have not concluded them at all.

In fulfilling the decisions of the 30th Belorussian CP Congress, the Presidium of the Belorussian SSR Academy of Sciences charged the institutes to submit proposals on the large-scale introduction of their developments in the republic. However, their analysis showed that only the institutes of technical cybernetics and applied physics submitted practicable, worked out proposals. The other collectives limited themselves merely to general formulations. The academician secretaries of the departments and the vice presidents, who examined the institute proposals, treated this serious matter formally.

The speaker emphasized that the presidium and the bureaus of the departments are obliged to increase the demandingness on the institutes, while the direct responsibility for introduction should be assigned to the executives of the scientific institutions. The inadequate attention to this important matter on the part of party organizations and trade union committees was noted.

The analysis shows that introduction is being hindered at the stage of the duplication of innovations in the volumes which are necessary for the national economy. In this the country is incurring colossal losses.

For example, in 1972 the Physical Technical Institute successfully tested a low-waste technology and complex for the taper rolling of parts. It was calculated that given the full introduction of this development in the national economy of the country it is possible to save annually 200,000 tons of metal and to free 10,000 workers, while the proposed economic impact would come to 100 million rubles. Nevertheless the Ministry of the Machine Tool and Tool Building Industry so far has not organized the series production of such complexes. The institute, in order not to ruin the valuable development, was forced at its own pilot works, and its possibilities are very limited, to produce up to five complexes a year.

The institute needed only 5 years to cover the path from the elaboration of the idea to the production and testing of the first complex and nearly 15 years for the surmounting of the artificially created barriers. But another 5 years will be needed for the construction of a plant. What kind of reserve of scientific and technical strength should an idea have in order not to lose topicality in a quarter century? And how much did the national economy of the country lose? The institute was forced to continue for years to deal with it and to divert the forces of scientific associates and the pilot works. The events with the introduction of the new strain of sugar beets of the Institute of Genetics and Cytology, the fodder crops proposed by the Central Botanical Garden, the enamels of the Institute of General and Inorganic Chemistry, the instrument for checking the thickness of protective coatings of the Institute of Applied Physics, and several other valuable developments are just as cheerless. But the matter could have made headway long ago, had the corresponding superior organs exercised authority.

At the academy much is being done for the strengthening of the contact of science with production. The laboratories of dual subordination are justifying themselves and their number should increase. Two scientific engineering centers and eight temporary creative collectives with special-purpose additional financing have been established, such subdivisions have to be formed for the development of the principles of the latest technologies: membrane, laser, and plasma technology. The possibility of the organization at the base of the Institute of Nuclear Power Engineering of an intersectorial scientific and technical complex is envisaged.

Groups for the promotion of coordination and introduction have set to work in the oblasts of the republic. They should give assistance to institutes in the preparation of proposals on the large-scale introduction of developments in Belorussia. The practical experience of the work of the academy on common

5-year programs with republic and union ministries and departments and large associations merits approval.

An analysis of the activity of the institutes of the Social Sciences Department was made from the platform of the session. It was noted that researchers of these specialties are giving management organs of the republic too few major proposals and sound forecasts. They have to take an active part in the preparation of the master plan of the management of the national economy of Belorussia, to conduct profound and practically oriented research on the problem of the education of the individual and the possible means of stimulating his activity under the conditions of the acceleration of the socioeconomic development of the region, and to study the legal problems of state management.

The session participants spoke anxiously about the fact that often scientists are diverted for jobs which are not related to their basic activity. In 1985, for example, staff members of the Belorussian SSR Academy of Sciences spent at kolkhozes and vegetable bases 47,500 man-days, that is, 130 people (and this is the size of an average institute) during the year were absent from research laboratories.

The speakers also spoke about personnel problems and the need to change the system of the training of the young generation of scientists. In this connection the suggestion to unite the academy and the Belorussian State University into a unified whole was heard. The university would gradually transfer the training of teachers to pedagogical institutes and would engage in the training of scientists for the academy and other research institutions of the republic. It was emphasized that it is necessary already in the immediate future to devote efforts to the closer convergence of the academy with other higher educational institutions--this not only will have a positive effect on the level of the training of young specialists, but will also give impetus to joint research. The organization of the work of graduate studies also leaves much to be desired.

The equipment of the institutes was also discussed at the session. In particular, the efficient work of the centers for the collective use of unique and expensive equipment was noted. This experience merits attention, and it is necessary to increase the number of such centers. But as a whole the laboratories are poorly equipped. And it is a matter not of financial difficulties of the academy, but of the inadequate production of scientific equipment by industry. Scientists see a way out of the formed situation in the development and the setting up of the production of the necessary instruments on their own. The construction during this five-year plan of the second section of the central design bureau with a pilot works is planned--it will specialize in the production of small batches of instruments.

For the present the difficulties with the provision of pilot works with machine tools and production equipment are great. Approximately 40 percent of the stock of machine tools is worn out. The following example was cited: of the 10 ordered machine tools only 1 is being allocated by the Central Supply Administration of the USSR Academy of Sciences. Therefore, in this matter it

is impossible to do without the assistance of republic organs and union ministries.

Other questions of scientific, organizational, and economic activity were also touched upon.

Vice President of the Belorussian SSR Academy of Sciences Academician I.Ya. Naumenko; Belorussian SSR Minister of Health Academician N.Ye. Savchenko; Academician Secretary of the Chemical and Geological Sciences Department of the Belorussian SSR Academy of Sciences V.S. Komarov; Academician L.I. Kiselevskiy, rector of the Belorussian State University imeni V.I. Lenin; Corresponding Member of the Belorussian SSR Academy of Sciences L.I. Kolykhan, secretary of the party committee of the Belorussian SSR Academy of Sciences; Ye.Ye. Onegin, general director of the Planar Scientific Production Association; Academician of the Belorussian SSR Academy of Sciences N.N. Sirota; Academician of the Belorussian SSR Academy of Sciences I.I. Lishtvan, director of the Institute of Peat of the Belorussian SSR Academy of Sciences; Corresponding Member of the Belorussian SSR Academy of Sciences A.G. Lobanok, director of the Institute of Microbiology of the Belorussian SSR Academy of Sciences; and Deputy Chairman of the Belorussian SSR Council of Ministers V.I. Kritskiy took part in the discussion of the report.

The hearing of scientific reports took place. The 27th CPSU Congress on the strategy of the acceleration of the socioeconomic development of the country is the theme of the statement of Corresponding Member of the Belorussian SSR Academy of Sciences Ye.M. Babosov, director of the Institute of Philosophy and Law of the Belorussian SSR Academy of Sciences. Academician of the Belorussian SSR Academy of Sciences V.A. Pilipovich, director of the Institute of Electronics of the Belorussian SSR Academy of Sciences, told about the space-time modulation of light in optical information processing systems. O.I. Semenkov, director of the Institute of Technical Cybernetics, delivered the report "The System of the Automation of Structural and Technical Designing in Machine Building."

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INVENTING, EFFICIENCY WORK IN UKRAINIAN MOTOR TRANSPORT

Kiev PRAVDA UKRAINY in Russian 24 Apr 86 p 2

[Article by PRAVDA UKRAINY correspondent A. Maliyenko: "To the Detriment of Effectiveness. Notes From the Presidium of the Ukrainian Council of the All-Union Society of Inventors and Efficiency Experts"]

[Text] If all the participants in the meeting of the Presidium of the Ukrainian Council of the All-Union Society of Inventors and Efficiency Experts had not been acquainted in advance with the results of the check of the state of efficiency and inventing work in the Ukrainian SSR Ministry of Motor Transport, which revealed many serious shortcomings, the speech of Deputy Minister V. Reva at first might have put those present in an equable mood. Vitaliy Mikhaylovich cited detailed numerical computations, which attested to the progress in the creative technical work of the workers in the sector and to the fact that during the years of the past 5-year period the number of efficiency proposals and inventions had increased appreciably as compared with the indicators of the 10th Five-Year Plan.

The deputy minister also told about the system of "express introduction," which had been established in the sector and was called upon to ensure the rapid and mass use in production of priority developments, and named several efficient innovations. Here are if only two of them, which by right adorn the service record of the innovator-motorists--an energy-saving device for starting motors and a device for the transportation and unloading of cargo. They are very efficient. The former device, which is a unique thermos for the storage during the idle time of a motor vehicle of hot air, even per motor vehicle makes it possible during the cold period of the year to save a large amount of various resources: fuel, water, electric power; the latter--a container which can unload itself--on many transportation routes will simply be irreplaceable given the shortage of dump trucks.

The work being performed in the ministry on the promotion of advanced know-how is also impressive. For example, last year at the Exhibition of Ukrainian SSR National Economic Achievements the Avtointensifikatsiya-85 Intersectorial Exhibition and the personal exhibition of S. Fotti, a lathe operator of the Odessa Service Station, were held, about 200 technical innovations were displayed at the Motor Transport Pavilion, in accordance with an order of the ministry the Ukrtelefilm studio shot the color popular science film "The

Effect of Research"--on the experience of the best efficiency experts and inventors of the sector.

That part of the statement of the deputy minister, in which he turned to the essence of the question being heard, which, although it was formulated somewhat evasively--"On the Increase of the Efficiency of Inventing and Efficiency Work at Enterprises and Organizations of the Ukrainian SSR Ministry of Motor Transport"--supposed, first of all, a discussion of the unused reserves and the means of increasing the output of innovators, interested the meeting participants more. V. Reva also touched upon in his statement the unsolved problems and did not ignore the made miscalculations, true, without a numerical analysis. The ministry, of course, is taking steps on eliminating the shortcomings. For example, last year, in the words of Vitaliy Mikhaylovich, "the guilty people were even punished."

But why "even"? Should demandingness not really be the norm, and especially with respect to careless workers? Unfortunately, such an approach in the supervision of the efficiency and inventing work in the ministry, judging from the statements at the presidium, can sooner be called the exception than the rule. Take if only the checks being made by the ministry of organizations and enterprises with respect to questions of creative technical work. At best the violations are merely stated, but the corresponding documents with conclusions and suggestions are not drawn up. Such checks do not ensure the monitoring of the timely elimination of shortcomings and as a result are ineffective.

Here are the complaints which were expressed at the meeting of the presidium in address of the ministry with respect to the questions of the supervision of inventing and efficiency activity. The economic services there are not being enlisted in the calculation of the economic impact from the use of innovations. Primarily personnel, who do not have the appropriate knowledge, and frequently the authors themselves are engaged in this. But it is only one step from inadequate competence to the distortion of data and unscrupulousness, when what is desired is passed off as what is real. Workers of the All-Union Society of Inventors and Efficiency Experts repeatedly detected violations in the drawing up of reports and baseless indicators of the economic impact. The situation with the payment of rewards to the authors of innovations is also not well. So far the developers of the invention "A Dumping Semitrailer With Side Unloading" (inventor's certificate No 688356) have not received the reward, although the exact date of introduction--1 January 1984--appears in the documents. The inventor's reward for the device for the transportation and unloading of cargo, with which we are already familiar, has also not been paid. Yes, namely for the invention, one of the many, which V. Reva praised so much in his statement. Incidentally, the device for starting a motor, which was also named by Vitaliy Mikhaylovich, is being disseminated very slowly. The editorial office of PRAVDA UKRAINY has taken the introduction of this invention under control.

V. Shevchenko, chief of the Consolidated Department for Science and New Technology and a member of the Collegium of the Ukrainian SSR State Planning Committee, indicated the weak influence of efficiency and inventing work in the sector on the end results. The contribution of innovators to the increase of productivity and the decrease of the proportion of manual labor and to the

saving of resources is small. From year to year the number of developments, which have been included in the plan of the development of science and technology, is small, moreover, inadequate attention is being devoted to their novelty. Under such conditions it is difficult to avoid instances, when instead of inventions, which production really needs, developments, which do not yield an economic impact, are introduced.

On the average the efficiency per invention and efficiency proposal in the Ukrainian SSR Ministry of Motor Transport came last year respectively to 1,210 and 590 rubles--the lowest indicators in the republic. Citing this fact, V. Ryazantsev, chairman of the Ukrainian Council of the All-Union Society of Inventors and Efficiency Experts, as if anticipating possible references to the specific nature of the sector, drew a parallel with similar departments in other regions of the country. It turned out that the comparison with colleagues from the union republics also does not adorn the Ukrainian motor transport workers.

It is also impossible not to speak about the poor return of sectorial science. Hundreds of specialists, including 29 candidates of technical sciences, work at the State Scientific Research and Planning Institute of Motor Transport, but during the years of the past five-year plan not one invention was patented. While only 14 of the 58 inventions developed at the institute were introduced. And only 1 out of every 10 of its staff members annually participates in creative technical work.

Creative technical work has received inadequate dissemination among drivers--the basic category of workers of the sector, the ministry is not reporting the assignment on the mass nature of participation in it to organizations and enterprises.

Let us say frankly that the shortcomings, which were discussed in the presidium, were hardly news for the executives of the Ukrainian SSR Ministry of Motor Transport. Here they have simply gotten accustomed to them and are carried away by quantitative indicators without genuine interest in the specific results and in the stimulation of the movement of innovators. In confirmation of what was said let us also cite the following fact: annually only about 62 percent of the allocated assets are being spent on the development of invention and efficiency promotion. But it is well known that given competent use these assets pay for themselves with interest.

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WORK OF R.B. KHESIN IN GENETICS NOMINATED FOR LENIN PRIZE

Moscow IZVESTIYA in Russian 11 Mar 86 p 2

[Article by Lenin Prize winner Academician A. Spirin and Doctor of Biological Sciences Professor V. Gvozdev under the rubric "For the Lenin Prize": "Genes Control the Cell"]

[Text] The enormous successes of modern biology and its new field--molecular biology--are well known. It has given mankind a knowledge of the fundamental principles of heredity and the biosynthesis of protein. The practical implementation of this knowledge developed into modern gene engineering and biotechnology. The formation of the new science has been marked by the important contributions which scientists of our country have made, among them is Corresponding Member of the USSR Academy of Sciences R.B. Khesin.

The scientific biography of Professor Khesin, who died prematurely last year, is not entirely usual. After the Great Patriotic War, in which he was a participant, R.B. Khesin began scientific work at Moscow State University as an assistant lecturer of the Chair of Genetics. He obtained a number of interesting results, but was forced to change the direction of his research, since at that time the antiscientific views of Lysenko dominated in biology. R.B. Khesin transferred first to the Institute of Biological and Medical Chemistry of the USSR Academy of Medical Sciences, and then to the Kaunas Medical Institute. The talent of the scientist was revealed in another rapidly developing field--in biochemistry. Thus, he became both a geneticist and a biochemist. Precisely such a combination was needed for work in the new field of science, which received the name molecular biology.

In our country its development is connected with the establishment of new scientific subdivisions. The revival of research on genetics at a new--the molecular--level was their task. At the Institute of Atomic Energy a biology department was organized on the initiative of outstanding physicists--Academicians I.Ye. Tamm, I.V. Kurchatov, and A.P. Aleksandrov. R.B. Khesin played a main role in the determination of its scientific themes and in its organization. He conducted here research of extraordinary importance. Together with associates he was able to show experimentally how the development of an organism is controlled by genes.

The development of any organism, any living cell represents their change in time--the interchange of forms. Each stage of development is characterized

accordingly by its own distinctive attributes. This means that at each stage of development in a cell its own distinctive proteins are formed (synthesized), which is governed in turn by genes. In the works of R.B. Khesin with associates for the first time it was shown experimentally: genes "act" not all at once, they begin to act by groups--in succession. Now this truth is universally recognized. It became one of the fundamental principles of modern molecular biology.

In recent years the phenomenon of the variability of genes has attracted the attention of scientists (especially in connection with the discovery of mobile genetic elements). Its study is extremely important for the solution of the most urgent problems of basic and applied science. In particular, the problems of the variability of the genes of bacteria which acquire resistance to medicines. The variability of the set of genes (genome) of higher organisms governs the formation of immune systems of the organism, which combat infection or cancer cells.

The questions of the variability of the genome are also closely interwoven with the theory of the evolution of what is alive. R.B. Khesin, possessing a broad biological outlook and having his own original research, elaborated in his last years the problem of the variability (instability) of hereditary material. The results of this work are summarized in the monograph "Nepostoyanstvo genoma" [The Variability of the Genome] (1984). In it the problem is examined in connection with urgent practical and theoretical questions. The book received a broad response and is being used as a scientific handbook.

R.B. Khesin played an enormous role in the development of molecular biology and genetics, promoting the combination of genetic and biochemical methods for the solution of central biological problems. Such an approach is fruitful not only for the solution of fundamental scientific problems, but also for the development of new biotechnologies which are used in medicine and the national economy.

The services of the scientist are not limited to the development of individual fundamental sections of science. His numerous survey works and many years of supervision of seminars and schools on molecular biology and genetics had a large influence on the formation of an entire generation of scientists. R.B. Khesin always created around himself a highly moral atmosphere, his erudition, gift of foresight, and accuracy of experiment serve as an example for imitation.

The series of works of Corresponding Member of the USSR Academy of Sciences R.B. Khesin "The Molecular Principles of the Functioning of the Genome," which includes the monograph "Nepostoyanstvo genoma," has deservedly been nominated for the Lenin Prize.

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DEVYATYKH WORK ON HIGHLY PURE SUBSTANCES VIES FOR LENIN PRIZE

Moscow IZVESTIYA in Russian 17 Mar 86 p 3

[Article by Academicians N. Zhavoronkov and A. Prokhorov under the rubric "For the Lenin Prize": "For Highly Pure Substances"]

[Text] Our times are the age of electronics and computer technology. Everyone knows this. But only specialists know that it can be just as validly called the age of highly pure materials.

Substances are considered highly pure, if the total concentration of impurities in them does not exceed 0.0001 percent. They have become the material basis of a number of sectors of technology and industry, which govern the pace and level of scientific and technical progress. The number of highly pure substances and materials based on them is very large. In accordance with their special purpose these are semiconductor materials, materials for microelectronics and electronic engineering, optical materials, and others. That is why throughout the world active work is being performed on the development and improvement of the methods of obtaining and analyzing highly pure substances.

In our country a substantial contribution to the development of the problem of highly pure substances has been made by Academician G. Devyatykh. He together with his students conducted an extensive series of studies on the development of methods of obtaining highly pure volatile substances. Simple substances, volatile hydrides and chlorides, and organometallic compounds were the subject of the study. They are needed in a highly pure state for the obtaining of various materials both in the form of mass specimens and in the form of thin films.

In the elaborations of major scientific problems, which have been organized in the optimum manner, three components are always present: research, the goal of which is to get to know the studied object or phenomenon; research, the goal of which is to develop a new thing on the basis of the obtained knowledge (a material, an instrument, a process); work on the practical implementation of what has been learned and developed. In the works, to which the article is devoted, all three components were united so closely that in practice they constituted a unified whole.

The basic attention in the research was devoted to the methods of high purification. It was shown that the chemical methods, on which great hopes were placed, cannot ensure the obtaining of sufficiently pure substances, and the conclusion about the promise of multistage physical chemical methods of purification, which was subsequently completely confirmed, was drawn.

During the conducted research the known methods of high purification were improved substantially and new ones were developed. A large contribution was made to the development of crystallization methods of high purification.

All this made it possible to increase the degree of purity of a number of volatile substances by 10^3 more than during the period which pertains to the start of the work of this cycle. Here it is appropriate to recall the statement of the well-known Soviet materials technologist, Academician N. Sazhin, that the increase of the purity of substances by only an order of 10 is a scientific feat.

Owing to the progress in the obtaining of very pure volatile chlorides in the middle of the 1970's it was possible to launch quickly work on fiber optics and to create the first fiber optic communications lines in the country. The developed methods of obtaining and analyzing highly pure volatile substances found application at enterprises of the ministries of the chemical industry, nonferrous metallurgy, and the electronics industry. A certain amount of highly pure materials is being produced directly by their very developer--the Institute of Chemistry of the USSR Academy of Sciences. It seems that now, when the country is posing the tasks of the sharp acceleration of the pace of scientific and technical progress, the experience of the Gorkiy chemists in the organization of comprehensive operations, including the development of the scientific principles and technological processes and the practical use of new, highly efficient materials, merits a high rating and extensive dissemination.

The majority of works of the series being reviewed were the first in their area not only in domestic, but also in world science. The degree of purity of all the substances obtained by the Gorkiy chemists is not inferior, while that of many of them also surpasses the degree of purity of foreign analogues. The conducted research completed the formation of the problem of highly pure substances into an independent scientific subject--the chemistry of highly pure substances, the task of which is to obtain as many pure substances as possible and to study their properties.

All this gives reason to believe that the series of works of Academician G. Devyatykh, "The Development of Methods of Obtaining Highly Pure Volatile Substances," has been deservedly nominated for the 1986 Lenin Prize.

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MAGNETIC, SPIN EFFECT IN CHEMISTRY VIES FOR LENIN PRIZE

Moscow PRAVDA in Russian 18 Mar 86 p 3

[Article by Hero of Socialist Labor Academician M. Kabachnik under the rubric "For the Lenin Prize": "A Stimulus for the Molecule"]

[Text] A chemical reaction requires significant energy expenditures--as a rule, tens and hundreds of fold greater expenditures than the energy of the thermal motion of molecules at room temperature. In order to stimulate reactions, chemists assimilated diverse methods of pumping energy into molecules--heating, irradiation with light, electrons, plasma, lasers, and so on. But they did not examine in earnest the effect of magnetic fields. For the additional energy of the reacting chemical particles in the strongest magnetic fields now achievable is infinitesimal--millions of fold less than the energy of their thermal motion and hundreds of millions of fold less than the energy necessary for chemical reactions.

Therefore, the discovery by Soviet scientists of the strong effect of even weak magnetic fields with a strength of 100-1,000 oersteds on the chemical reactions in solutions and in molecular solids was a complete surprise. Here the yields of products and the speeds of chemical reactions, the intensity of luminous radiation by organic luminophors, the dark and light-induced conduction of organic semiconductors, and even the photosynthesis of green leaves changed. The magnitude of the "magnetic effect" with respect to the yield of products, luminous radiation, or conduction came to several tens of percent, while with respect to the interaction of radicals--even several hundred percent. Since 1965--it was observed for the first time precisely then--the effect of a magnetic field has been reliably demonstrated in an enormous number of chemical reactions of various types, the dependence of the magnitude and sign of the effect on the type of reaction, the conditions and modes of its occurrence, and the strength of the magnetic field has been found. Its discovery was registered by the USSR State Committee for Inventions and Discoveries.

Later it was shown that not only an external magnetic field, but also the internal fields, which are created by the nuclei of the reacting particles, if these nuclei have a magnetic moment, have an effect on chemical reactions. This new phenomenon was called the magnetic isotope effect and was registered by the USSR State Committee for Inventions and Discoveries.

The first solution of the secret of magnetic effects was given by Soviet scientists. The simplest physics of these phenomena consists in the following. It is well known that electrons are kinds of quantum spinning tops, that is, have a torque--it is called the spin. The spin has a specific orientation, which is maintained in space, in much the same way as a gyroscope maintains the orientation of the spin axis. In essence both the electron and the magnetic nucleus are quantum gyroscopes. While the chemical reaction carries out their sorting.

The service of Soviet scientists consists in the fact that they provided a solution to the paradox: weak magnetic actions, which are negligible in energy, have a strong effect on chemical reactions, changing the spins of the reacting radicals and eliminating the spin exclusions. This is revealing new methods of controlling chemical reactions, which have not an energy, but a spin nature.

The discovery of the new effects is also having important consequences for related sciences--geochemistry and space chemistry--and is outlining ways of solving the problems of the origin and chemical evolution of natural bodies--ores, minerals, petroleum, meteorites, and so on. For chemical evolution is a set of an enormous number of chemical reactions, among which there could also have been such ones which separated magnetic and nonmagnetic nuclei over millions of years. By analyzing now isotope anomalies--the traces of this separation, which have come down to us, it is possible to recreate, to restore the paths of chemical evolution and the fates of matter in nature.

Another important consequence of the isotope effect is the property of radical chemical reactions, which was discovered by Soviet scientists, to generate an electromagnetic radio-frequency field. Under certain conditions a reaction behaves like a molecular quantum oscillator--a maser. Masers and the principles of their operation are well known in physics and technology, Soviet scientists were able for the first time to accomplish the chemical pumping of energy in a maser.

The discovery of the "maser" effect in chemical reactions is creating the basis for the development of new instruments and technical devices in magnetometry. A model of one such instrument is already in operation. This is another vivid example of the integration of sciences--the joining of such, it would seem, different sciences as chemistry and quantum radiophysics.

The Soviet scientists--Yu. Molin, A. Buchachenko, R. Sagdeyev, K. Salikhov, and Ye. Frankevich--have been nominated for the Lenin Prize for the series of works "Magnetic and Spin Effects in Chemical Reactions." The discovery of the new phenomena revealed the fundamental role of magnetic actions in chemistry and gave rise to spin chemistry. This is an actively developing field, its ideas have undergone reliable experimental checking, tens of laboratories in our country and abroad are conducting research in the directions paved by the authors, the founders of spin chemistry.

The discoveries of spin chemistry constitute the pride of domestic science, they belong to the most important achievements of modern chemistry, surpass the world level, and have received extensive recognition.

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WORK ON QUANTUM CRYSTALLIZATION NOMINATED FOR LENIN PRIZE

Moscow PRAVDA in Russian 22 Mar 86 p 3

[Article by Academician S. Vonsovksiy and Academician L. Keldysh under the rubric "For the Lenin Prize": "Stars and Atoms"; first paragraph is PRAVDA introduction]

[Text] The entire experience of scientific and technical progress attests that practicable results in equipment and technology are achieved when they are based on the latest achievements of basic research. Therefore, in the new version of the CPSU Program special attention is directed to the importance of the leading development of basic research.

Modern physics has achieved the most impressive gains in recent times in diametrically opposed directions. On the one hand, these are high energies and elementary particles and, on the other, extra low energies. On approaching absolute zero the quantum effects, which are inherent in the microcosm, can acquire a macroscopic nature. This circumstance was identified earlier in such phenomena as superfluidity and superconductivity.

In recent years it has become clear that there exists an entire area of condensed-state physics, for which the quantum tunnel transfer of matter at the level of atoms and even heavier many-particle formations is decisive. Under these conditions a completely new class of phenomena, which does not have analogues in the classical physics of the condensed state of matter, arises. All the basic ideas and notions in this new area of physics, just as the direct experimental detection of the phenomena predicted by theory, were obtained in the works of Soviet scientists, which predetermined here the world level of the development of research. The series of works of A. Andreyev, Yu. Kagan, K. Keshishev, L. Maksimov, V. Mikheyev, and A. Parshin, "The Tunnel Transfer of Matter and Quantum Crystallization (Prediction and Experimental Detection)," which was nominated for the 1986 Lenin Prize, unites the basic results which were achieved in this area.

The advanced ideas and the developed theory are of a general physics nature. They were used extensively in our country and abroad when studying such different problems as the kinetics of the magnetic reversal of domains, the emergence of eddies in a quantum fluid, the movement of dislocations, and the

decay of the superdense state of nuclear matter and the metastable state of neutron stars.

The further development of the notions of the tunnel movement of matter ledto the prediction of a very unexpected phenomenon--quantum crystallization and quantum liquefaction, which occur at a low temperature at the boundary of the liquid and solid phases. The authors discovered experimentally this phenomenon, by studying the processes at the boundary of solid and liquid helium. A sharp increase of the speed of crystallization with a decrease of temperature was detected as opposed to the usual slowing of the growth of a crystal in case of cooling. Waves at the interface, which are the periodically alternating processes of crystallization and liquefaction, were discovered here. These waves received the name of crystallization waves. Their properties proved to be in exact conformity with the prediction of theory. It is possible to observe these waves visually on the developed unique cryogenic device. This made it possible even to shoot a film, which actually shows on a real-time scale macroscopic phenomena of a quantum nature.

The discovery of the phenomenon of quantum crystallization gave rise to an entire direction of research, which is connected with the study of the equilibrium form of crystals, the rate of growth in the vicinity of the phase transition of the constraint, the passage of sound and heat through the phase boundary, and so forth.

The notion of tunnel movement led the authors to the idea that any atom can move freely in a crystal at a temperature of Ø degrees in much the same way as electrons in metal. As a result the phenomenon of quantum diffusion was predicted.

Many unusual effects, which are connected with quantum diffusion, were discovered experimentally and were studied in detail in the works of the submitted series. The development of an experimental unit, which significantly surpasses in its parameters similar units in other countries, was required for this.

The series of works, which has been nominated for the Lenin Prize, lays the scientific foundations of the next generation of technology which is connected with the use of low temperatures. The rare unity of theory and experiment is a distinctive feature of it. One should specially emphasize the fact that all the basic theoretical and experimental results in this new field of physics were obtained in our country, at institutes which are well known for their scientific traditions and creative atmosphere: the Institute of Physical Problems imeni S.I. Vavilov, the Institute of Atomic Energy imeni I.V. Kurchatov, and the Kharkov Physical Technical Institute of Low Temperatures.

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ALEKSANDROV ON WINNERS OF LENIN PRIZE IN SCIENCE, TECHNOLOGY

Moscow PRAVDA in Russian 23 Apr 86 p 3

[Article by Academician A. Aleksandrov, chairman of the Committee for Lenin and USSR State Prizes in Science and Technology attached to the USSR Council of Ministers, under the rubric "We Tell About the Lenin Prize Winners": "In the Vanguard of Science"; first paragraph is PRAVDA introduction]

[Text] The requirements of the acceleration of scientific and technical progress, which were stated so vividly in the Policy Report of the CPSU Central Committee to the 27th party congress, had the result that all the creative forces of our homeland received a powerful impetus which is aimed at the fulfillment of this task. The party demands should lead without any delay to real reform, the complete mobilization of all creative forces, and the breaking down of the formal obstacles, which have become customary, before new effective scientific and technical solutions.

The winners of the Lenin Prize and the USSR State Prize are a large detachment of creative forces of our homeland. Their creative participation in the settlement of "the difficulties of introduction" in the areas close to them can lead to very significant results. And such activity is their immediate moral duty. The recognition by the homeland of their great achievements obliges the winners to take the lead in the development of the creative process.

Today we are commending the next reinforcement of the cohort of Lenin Prize winners.

The title of Lenin Prize winner is awarded after the careful selection of works. The initial selection is made at institutes, higher educational institutions, ministries, and departments. The most worthy ones are submitted to the Committee for Lenin Prizes and USSR State Prizes. It is natural that the demands on the level of the works will also increase later.

In all 17 works were submitted for the 1986 Lenin Prize to the committee. After the two-stage discussion at the sections and plenums of the committee and the public discussion in the press and at scientific organizations eight works, on which a positive decision was also given by the CPSU Central Committee and the USSR Council of Ministers, were recommended for the awarding of the prize.

The first work of A. Andreyev and others is devoted to the discovery and experimental confirmation by the authors of a new phenomenon in physics--the tunnel transfer of matter and quantum crystallization.

Previously it was believed that in solids any transfer of matter, for example, the formation of the centers of a new phase and so on, can occur only due to the fact that the energy of the thermal motion of atoms at times exceeds the barriers of the potential energy in a substance, and this enables them to pass over the barrier. This classical diffusion transfer of matter increases sharply with an increase of temperature and decreases in case of cooling. Many properties of substances--the transition from one crystalline form to another, the distribution of impurities, and so on--are connected with this process.

The authors discovered a completely different process, a purely quantum process--the barriers can be surmounted by a particle due to tunnel, subbarrier transitions, when the energy of the atom is less than the magnitude of the barrier. The contribution of this effect increases with a decrease of temperature (unlike conventional diffusion) and can lead to the quantum crystallization of matter, which speeds up with a decrease of temperature. Hence follow a large number of new, unexpected properties of matter--in essence a new chapter of solid-state physics.

This work has received world recognition, and now intensive research is being conducted in this new fundamental field.

The second work on physics of S. Denisov and others is "Inclusive Processes in the Strong Interactions of Particles of High Energies." A new approach to the study of the multiple production of strongly interacting particles--hadrons--is proposed in this series.

The collision of high-energy particles leads to the multiple formation of secondary particles. It is extremely difficult to analyze such a phenomenon, and the authors proposed to study the aggregate (inclusive) process, when only one particle of the given type is detected in the final state. This led to the discovery of a new law for the microcosm--the scale invariance of cross-sections, which was registered as a discovery and is of fundamental importance.

The set of these studies at the Institute of High Energy Physics in Serpukhov opened up new directions in high energy physics, was confirmed at foreign accelerators in the European Council for Nuclear Research (Switzerland) and the Fermi National Accelerator Laboratory (the United States), and received extensive world recognition.

The work "Global Asymptotic Methods of the Theory of Linear Equations With Partial Derivatives" of V. Maslov does not need description. The method received in world literature the name "the Maslov Method," "the Maslov Theory." The works of the scientist are universally recognized and are in this area the leading ones in the world.

In chemistry the works of V. Korshak "The Processes of Synthesis and the Properties of Polymers" were deemed worthy of the Lenin Prize. The author developed methods of the synthesis of a number of hetero-organic polymers--organoboron, organophosphorus, and others. The works of the author were a substantial contribution to the industrial production of polymer materials in the country, although the foreign level has been achieved in only a few directions.

The work of Yu. Molin and others "Magnetic Spin Effects in Chemical Reactions" is an important basic work in the field of chemistry. For many years it was believed that magnetic fields cannot affect the occurrence of chemical reactions, since the forces, which operate here, are many orders less than the electric forces which operate between atoms or ions. The discovery of the authors consisted in the fact that they detected the effect of magnetic fields on the spins (magnetic moments) of the electrons of the reacting particles. These works received world recognition and led to the development of a new field of chemistry.

In the field of chemistry the study on the methods of obtaining pure substances, which were conducted in Gorkiy by G. Devyatykh, were also awarded the prize.

On the basis of the developed method a number of substances with a total content of impurities of 0.0001-0.00001 percent were obtained! The level of purity of a number of substances surpasses foreign analogues.

The Lenin Prize was awarded posthumously to R. Khesin-Lurye, an outstanding specialist in molecular genetics, for the series of works "The Molecular Principles of the Functioning of the Genome." The author made an important contribution to the study of the regulation of the activity of genes in bacteria and higher organisms, as well as to the study of the problem of the variability of the genome. The results of this work are exceptionally important for selection, the overcoming of the resistance of bacteria, and the development of new antiviral compounds. The work is an outstanding achievement in the area of molecular biology and genetics.

The work of Yu. Aleksandrov and others "The Radar Survey of the Surface of the Planet Venus" was awarded the Lenin Prize. The Venera-15 and -16 spacecraft for the first time in the world made a detailed survey of the surface of Venus from its north pole to the latitude of 30 degrees.

This work led to the development of side-looking radar devices, which were accompanied by a system for the transmission and processing of the information, which makes it possible to compensate for the distortions of the image due to the change of the angle of sight and the distance. The obtained results are of outstanding importance in world studies of the planetary system and will also find extensive application in space research in the future.

While congratulating the new Lenin Prize winners on the lofty title and the recognition of their services by our homeland, I cannot but direct their attention to one peculiarity. For example, the staff members of the Institute of Radio Engineering and Electronics of the USSR Academy of Sciences and the

Experimental Design Bureau of the Moscow Institute of Power Engineering performed excellent work on the study of Venus. But it is worth directing attention to the fact that the excellent system, which was developed at their institute (the Institute of Radio Engineering and Electronics), for the determination from an airplane of the moisture content in the soil, the monitoring of irrigation, and the danger of salinization for more than 10 years has not been able to be properly introduced. It was produced in several copies at the Institute of Radio Engineering and Electronics, was tested at the Karakumy Canal, in Moldavia, and in Saratov and Astrakhan Oblasts, and everywhere yielded excellent results. The Ministry of the Radio Industry could have made at its enterprises 100-200 sets of these devices during the five-year plan, but both inadequate and excessive irrigation decrease the yield, an excess of water washes fertilizers away into reservoirs and rivers and leads to salinization. How good it would be for the USSR Agroindustrial Committee to monitor irrigated lands! The other day Minister P. Pleshakov told me that he will make these radiometers. He should get things going!

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POWER SECTOR CONTROL SYSTEM NOMINATED FOR AZSSR STATE PRIZE

Baku BAKINSKIY RABOCHIY in Russian 21 Mar 86 p 2

[Article by Corresponding Member of the Azerbaijan SSR Academy of Sciences T. Aliyev, chief of the Chair of Information, Measuring, and Computer Equipment of the Azerbaijan Institute of Petroleum and Chemistry imeni M. Azizbekov and winner of the USSR and Azerbaijan SSR State Prizes, and Doctor of Technical Sciences Professor A. Kerimov, chief of the Chair of Electric Networks and Systems of the Azerbaijan Institute of Petroleum and Chemistry imeni M. Azizbekov, under the rubric "For the Azerbaijan SSR State Prize": "An Automated Control System Controls the Power"]

[Text] The present level and prospects of development of the energy sector, which are specified by the Basic Directions of the Economic and Social Development of the Country and the USSR Energy Program, require the qualitative reform of the methods and means of the management of power engineering on the basis of modern electronic computer technology. In the Azerbaijan Power System significant scientific research, planning, and organizational measures, as a result of which the Republic Sectorial Automated System of the Management of the Energy Sector (the ROASU Energiya) was developed and introduced, have been implemented in 15 years.

At the first stage the Department of Automated Control Systems of the Azerbaijan SSR Main Administration of Power and Electrification--one of the first in the sector--carried out the development and introduction of subsystems and tasks, which are connected mainly with the management of the operating conditions of the power system. As a result: the first section of the automated control system of the Azerbaijan SSR Main Administration of Power and Electrification was put into commercial operation.

At the second stage, along with the expansion and development of the automated system of dispatcher control, significant attention was devoted to the development of the automated control systems of the enterprises of electric power networks. The need for the close creative cooperation of scientific and production organizations resulted in the formation at the Azerbaijan Scientific Research Institute of Power Engineering of a special scientific subdivision. The placement into operation of the second section of the automated control system of the power system, as well as the first rapid

information complex in Transcaucasia and the first section of the automated control system of the Khachmas Enterprise were the results of the work.

The third stage is characterized by the enlistment in the development of the republic system of a number of enterprises: of the State Inspectorate for Industrial Power Engineering and Power Engineering Supervision and Azenergonaladka, support centers for the gathering and primary processing of information are being organized. During the past five-year plan the first sections of the automated control systems of the Mingechaur, Kirovsk, and Lenin enterprises were put into operation. For the first time in the USSR Ministry of Power and Electrification plant technical management automation systems are being put into operation at the Khyrdalan Substation and at the Azerbaydzhanskaya GRES. The development of the software and hardware is being completed, the exchange of rapid information between the Azerbaijan SSR Main Administration of Power and Electrification and the Department of Dispatcher Control of Transcaucasia (Tbilisi) via telemetry channels has been organized. The first section of the automated system of dispatcher control has been put into service.

The developers of the Energiya Republic System achieved by the end of the third stage an important recognition. The Azerbaijan SSR Main Administration of Power and Electrification was named one of the base organizations of the country for the assimilation and introduction of complexes and tasks of automated control systems. Finally, by this period the diagram of the republic system, the ROASU Energiya, had been completely formed. It became a control system with many levels. Let us give a brief account of its characteristic features. Considerable loads lie on the automated system of dispatcher control, which is included in the ROASU Energiya. It is engaged in the solution of problems of the planning, control, and management of operating conditions. A rapid information complex is operating successfully in it. It makes it possible to supply the dispatchers and managers constantly and in good time with the information which arrives from all the power facilities of the republic. Owing to it daily reports are being compiled and the strict analysis of the operation of telemetry has been organized. Moreover, the data for the scrupulous review of emergency situations have been systematized. In general, the automated system of dispatcher control made it possible to increase the quality and soundness of planning and the decisions being made. It is making it possible to properly distribute energy and to optimize the management of operating conditions.

The automated system of organizational control, which is a part of the ROASU Energiya, has a strict orientation. Figuratively speaking, it watches over the consumption of fuel and energy resources, it is the most important tool in the matter of their saving. The tasks of this automated system are the calculation of the technical and economic indicators of both electric power plants and the Azerbaijan SSR Main Administration of Power and Electrification as a whole. Their analysis, the drawing up of the annual plan of the generation of electric power, the consumption of fuel, and so forth are being carried out. Owing to the system of organizational control information on the state of the equipment and various statistical data for one period or another are being delivered to the USSR Ministry of Power and Electrification, to Moscow.

The introduction of the automated system of organizational control first of all made it possible to tighten up as much as possible the monitoring of the fulfillment of the outlined measures. It made it possible, if it can be said this way, to formulate the strategy of the economic activity, management, and planning of the Azerbaijan SSR Main Administration of Power and Electrification. Finally, it is important that the efficiency of the activity of the management personnel increased significantly, moreover, without an increase of their staff.

We have already mentioned plant technical management automation systems. The one of them, which is in operation at the Azerbaydzhanskaya GRES, carries out the processing and monitors the reliability of a significant number--more than 1,000--of signals on the parameters of the operating conditions and the state of relay protection devices and automatic equipment. The recording of emergency situations and many other functions on the gathering of various information are in its "charge."

Thus, the ROASU Energiya unites all levels of management of the sector in the republic. It created the possibility for the more stable and reliable power supply of national economic and social facilities of Azerbaijan.

The scale, advanced scientific and technical level, extensive industrial assimilation, and great economic efficiency and importance of the results for the intensive economic and social development of the republic give grounds to recommend the indicated work for the awarding of the Azerbaijan SSR State Prize in Science and Technology.

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BRIEF

USENKO IS UKSSR HONORED SCIENCE FIGURE--Ukase of the Presidium of the Ukrainian SSR Supreme Soviet. On the Conferment on Corresponding Member of the Ukrainian SSR Academy of Scences I.S. Usenko of the Honorary Title of Honored Figure of Science of the Ukrainian SSR. For services in the development of geological science and the training of scientists to confer on Corresponding Member of the Ukrainian SSR Academy of Sciences, Doctor of Geological Mineralogical Sciences Ivan Stepanovich Usenko, chief of a department of the Institute of Geochemistry and Mineral Physics of the Ukrainian SSR Academy of Sciences, Kiev, the honorary title of Honored Figure of Science of the Ukrainian SSR. [Signed] Chairman of the Presidium of the Ukrainian SSR Supreme Soviet V. Shevchenko. Secretary of the Presidium of the Ukrainian SSR Supreme Soviet N. Khomenko. Kiev. 26 March 1986 [Text] [Kiev PRAVDA UKRAINY in Russian 28 Mar 86 p 3] 78Ø7

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PATON SPEECH AT 27TH CPSU CONGRESS

Kiev PRAVDA UKRAINY in Russian 6 Mar 86 p 2

[Speech by B.Ye. Paton, president of the Ukrainian SSR Academy of Sciences and director of the Institute of Electric Welding imeni Ye.O. Paton, at the 27th CPSU Congress in Moscow: "The Speech of Comrade B.Ye. Paton (President of the Ukrainian SSR Academy of Sciences, Director of the Institute of Electric Welding imeni Ye.O. Paton)"]

[Text] Dear comrades! We listened with enormous attention to the Policy Report of the Central Committee of the Communist Party of the Soviet Union. In it the urgent problems of the present critical stage were analyzed from a fundamental party standpoint, the directions of reorganization and the key tasks of the acceleration of our socioeconomic development were specified, and the Soviet conception of the peaceful future of mankind was clearly formulated.

The congress documents will undoubtedly supplement the theoretical arsenal of our party. The acceleration of socioeconomic development and the strategy of the party are the key to the solution of all our problems. This strategy stands out in the report of Nikolay Ivanovich Ryzhkov.

Fully supporting the policy elaborated by the party, the scientists of the Ukraine are striving to place at the service of the national economy the enormous creative potentials of science.

On the basis of the principle of the fundamental unity of Soviet science, we are closely cooperating with the Academy of Sciences of the Soviet Union and the academies of sciences of the fraternal union republics and are concentrating scientific forces and material resources first of all on the main directions in which we can ensure the attainment of leading positions in domestic and world science.

Truly important fundamental results have been obtained by us in several directions. New efficient technologies for machine building, metallurgy, and otherbranches of industry have been developed on the basis of a number of them.

The Ukrainian SSR Academy of Sciences is devoting much attention to the strengthening of the contacts with production and to the development and improvement of their forms. This made it possible during the years of the 11th Five-Year Plan to introduce in the national economy 7,500 works with an economic impact of more than 3 billion rubles, to obtain 10,600 certificates of authorship for inventions, and to conclude 95 license agreements. (Applause)

These indicators exceed by 1.5- to 2-fold what was achieved during the preceding five-year plan. But, comrades, we are well aware that with allowance made for the new tasks what we have done is obviously insufficient.

The implementation of the strategic policy of the party requires that science fully realize itself as an immediate productive force. The conditions for this exist in our country. Soviet science is the recognized leader in many directions of the natural sciences, technology, and the social sciences. Thorough fundamentality was always its strong point.

We are obliged also in the future to ensure the leading development of basic research. However, it is necessary to combine the search for new knowledge more completely with the concern for its practical use, as the party requires today.

I will dwell on several, in our opinion, important questions which are connected with the achievement of this goal. First of all it is necessary to strengthen significantly the orientation of basic research toward the solution of scientific and technical problems of great national economic importance and the obtaining of results in the form of major technologies, which yield comprehensive solutions and ensure the all-round modernization of production enterprises and entire sectors of our economy.

Here, unfortunately, far from everything is yet smooth. It is often difficult to overcome inertia and to reorient existing departments, laboratories, and, at times, entire institutes toward new important, decisive problems, having given up obsolete, traditional themes which have been elaborated for decades. We need in this connection to overcome a certain timidity and to include this great reserve in the matter. As a whole it is necessary to change over more rapidly to the intensive, truly intensive, development of our science.

The second thing that we need to ensure is an extensive scale of introduction. Even hundreds, and at times thousands of developments, which are used on an individual scale, create merely the appearance of progress. It is possible to achieve a radical change in this matter only on the basis of the vigorous reciprocal efforts of scientists and production workers and the united actions and common decisions of all interested parties. We understand and acknowledge that science has done far from everything possible for large-scale introduction. The main thing that scientists should ensure here is an adequate degree of completion of developments with allowance made for the real possibilities of enterprises with respect to their bringing up and placement into series production. For this it is absolutely necessary to have at scientific institutions a developed experimental design and production base. Much also depends on the position of the workers of production. A genuine

interest in innovations and the ability and desire to take justified risks and not to shirk responsibility are required of them.

We know many progressive-minded executives of ministries, departments, and enterprises, whose initiative and energy are ensuring the rapid large-scale introduction of highly efficient technology, materials, and equipment. But today, of course, it is no longer possible to rely only on the lofty personal qualities of individual workers. The urgent need has arisen for the development of a unified organizational and economic mechanism of the acceleration of scientific and technical progress, of which the special-purpose and prompt support of priority operations, the strict cost accounting relations of the parties, the optimum combination of the rights and responsibility of managers, and the interest of all the workers in the achievement of the highest technical and economic indicators should become components.

The process of forming such a mechanism in essence has already begun. During a visit to our republic in the summer of last year Mikhail Sergeyevich Gorbachev showed a great interest in the work of the scientific and technical complexes and engineering centers of the Ukrainian SSR Academy of Sciences and noted the great possibilities of the new organizational forms. We are proud of the high rating in the Policy Report of the Central Committee of the initiatives of the party organization of our republic in the matter of establishing interbranch scientific and technical complexes and engineering centers and saving resources.

The powerful interbranch scientific and technical complexes, which were established in our country in conformity with the decree of the CPSU Central Committee and the USSR Council of Ministers in December of last year, should become an important unit of the new structure of management.

We are convinced that in a number of cases they will make it possible in a short time to attain leading levels in the world in important directions of scientific and technical progress.

Further. The success of all our work on the acceleration of scientific and technical progress to no small degree depends on the balanced planning of its priority directions. Here one must not direct one's attention only to the achieved level. It is necessary to take into account the long-range needs of the country. Otherwise we will plan an obvious lag. I will cite just one example. The Soviet Union now consumes as much steel pipe as the United States of America, Japan, the FRG, England, France, and Italy taken together. In these countries the consumption of steel pipe is steadily decreasing, it is being used only where it cannot be replaced by nonmetallic pipe, and first of all plastic pipe.

Our needs for such pipe are enormous. It can and should be used very extensively in case of the installation of gas facilities in population centers, especially in rural areas, and in case of the development of systems of water supply, watering, and irrigation. This makes it possible to save enormous amounts of metal, since 1 ton of plastic pipe replaces 4-5 tons of

steel pipe. Here it serves not less than 50 years without any insulation. Meanwhile, for the present a fivefold lag in the production of plastic pipe in 1990 behind the level achieved in the United States in 1984 is being incorporated in the plan. The reason is the lack of polyethylene and production capacities. But such a reason, unfortunately, is also being retained for 2000, which, in our opinion, is entirely unacceptable.

I should regretfully note that the activity on the acceleration of scientific and technical progress, which is dynamic and rational in its nature, in a number of cases is now surrounded by an enormous number of all kinds of documents, forms, tables, and unnecessary bureaucratic procedures. The work itself is frequently lost behind them, while the vital matter is being replaced by mere paperwork. Though regrettable, the activity on the organization of intersectorial scientific and technical complexes, as well as engineering centers, is now not void of similar shortcomings.

Comrades! The questions touched upon above are acquiring particular urgency in connection with the fact that we have already begun the implementation of the exceptionally difficult and responsible tasks of the Comprehensive Program of Scientific and Technical Progress of the CEMA Member Countries to 2000, which was adopted at the end of last year in Moscow.

As is emphasized in the Policy Report of the CPSU Central Committee, the extensive interaction of scientific institutions and enterprises of the Soviet Union and the fraternal socialist countries is an important reserve of the attainment of leading levels of modern technology. The scientific supervision of one of the five priority directions of this program, namely: "New Materials and the Technologies of Their Production and Processing," by which there is envisaged the development of unique ceramic, composite, polymer, semiconductor, and new metallic, including amorphous, materials and the industrial technologies of their production and processing, has been assigned to us. We have attached to these operations two interbranch scientific and technical complexes, seven engineering centers, and the scientific forces of many institutes of the Ukrainian SSR Academy of Sciences. The tasks here are very, very difficult. First of all a new organizational economic mechanism and the elimination of the above-noted shortcomings are once again necessary precisely for their accomplishment. Without this, with allowance made for the shortest time, namely only 15 years, it is difficult to count on serious success in the achievement of leading positions in the world in the key directions of modern scientific and technical progress. In this connection great tasks face the party organizations of our complexes, institutes, and enterprises, which should make every worker conscious of all the responsibility of the matter assigned to us and take an active part in overcoming the arising problems and obstacles. We need to begin without delay joint friendly work with our comrades from the fraternal countries. For specific end results in the development of new technology and fundamentally new materials, machines, and mechanisms should be achieved already during this--the 12th--five-year plan. The communists of our academy regard the efficient, coordinated fulfillment of operations with colleagues from the fraternal countries not only as their most important production task, but also as a direct political, party, and international duty.

And a last thing, comrades. In the achievement of the set goals the human factor is of particular importance. The efforts of the party organizations and scientific and production collectives should be focused on its maximum stimulation. The fates of scientific and technical progress in many respects depend on who will take and carry further the torch of scientific research. Therefore, the training of a worthy scientific replacement and the attraction to science of talented, I would say, overcome young people are a task of great state and political importance.

The next reinforcement of young scientists is already studying today at schools and higher educational institutions. It is necessary to carefully identify those who have an aptitude for scientific work, to properly orient them, and to carefully train them for professional activity in science. This should be taken into account without fail when improving the system of higher education. At the same time we should show concern for the increase of the prestige of scientific labor and improve resolutely the entire set of conditions which ensure the coming of talented young specialists to our academic institutes. Specific government decisions and, of course, the drastic improvement of all our work in this area are necessary here.

Dear comrades! The scientists of the Soviet Ukraine, perceiving the program goals of the party as their vital concern, will make a significant contribution to the development of the economy and culture of our beloved homeland! (Applause)

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PATON ON ELECTRIC WELDING COMPLEX, METALLURGICAL ACHIEVEMENTS

Moscow KOMSOMOLSKAYA PRAVDA in Russian 14 Mar 86 p 2

[Interview with President of the Ukrainian SSR Academy of Sciences Academician Boris Yevgenyevich Paton, director of the Institute of Electric Welding imeni Ye.O. Paton of the Ukrainian SSR Academy of Sciences, twice Hero of Socialist Labor, and delegate of the 27th CPSU Congress, by KOMSOMOLSKAYA PRAVDA correspondent P. Polozhevets under the rubric "The Program of Our Life" (Kiev): "The Navigators of Progress"; date and occasion not given; first three paragraphs are KOMSOMOLSKAYA PRAVDA introduction]

[Text] "The party supports bold research, the competition of ideas and directions in science, fruitful discussions. Both scholastic arguments and the passive registration of facts, which shuns bold theoretical generalizations, opportunism, and loss of contact with reality are contraindicated to science." So it is recorded in the new version of the CPSU Program, which was adopted by the completed 27th party congress.

Boris Yevgenyevich Paton, a congress delegate, academician, twice Hero of Socialist Labor, president of the Ukrainian SSR Academy of Sciences, and director of the Institute of Electric Welding imeni Ye.O. Paton of the Ukrainian SSR Academy of Sciences, tells about the contribution of scientists to the acceleration of the development of our society.

Boris Yevgenyevich defended his diploma at the Kiev "Polytechnical" in the summer of 1941. In his pocket was an order to Gorkiy, to the Krasnoye Sormovo. He would start to work, but soon they would transfer him to Nizhniy Tagil. There his father, Yevgeniy Oskarovich, with his associates had been seeking persistently a means to the automatic welding of the hulls of tanks. And he found it. In Germany it did not turn out, in the United States they did not succeed, but we were able to. The weld proved to be stronger than the armor. They would call it the Paton weld. Then they would call by the same name an automatic high-speed welder, a bridge in Kiev over the Dnieper, an institute, which would become the arbiter of new technologies and materials, the leader of world welding....

[Question] Boris Yevgenyevich, the need for the further improvement of the organizational and economic forms of the integration of science and production and the establishment in the country of a network of interbranch scientific

and technical complexes following the example of the scientific and technical complex of the Institute of Electric Welding imeni Ye.O. Paton was emphasized at the party congress. In what does the effectiveness of interbranch scientific and technical complexes lie?

[Answer] I will begin with figures. According to the data of the State Committee for Science and Technology, 80 percent of the new developments are introduced at only 1 enterprise, less than 20 percent--at 3-4. And only 0.6 percent--at five and more. The experience of our academy and several other scientific centers of the country attests that there are a significant number of developments which have not been introduced at all anywhere. We have to pay dearly for our slowness and lack of coordination when using the developed scientific and technical potential. The instances, when priority in one scientific development or another belongs to Soviet scientists, but the technologies, equipment, and materials, which have been developed on its basis, have to be purchased abroad, are not that rare. This happens because often the results of research and development wander a long time in the interdepartmental labyrinths, cannot overcome the artificially created barriers and obstacles, and do not find in good time their potential user. Here the references to the shortage of resources and capacities and to the peculiarities of the structure of our industry have become traditional. While the main thing--the introduction of what is new--is being placed in the background. This is causing the state enormous losses. It is exactly the interbranch scientific and technical complexes that are called upon to eliminate all these problems. We are not only developing new ideas. We are bringing them up of industrial association. Moreover, in the process of introducing a development it is possible to modify it in the interests of the sector and to improve it qualitatively. We are striving without fail to see to it that the equipment and technology being developed by us not only would conform to the world level, but would also surpass it. The interbranch scientific and technical complexes are also affording extensive opportunities for the training and advanced training of highly skilled personnel in the required specialty and are creating favorable conditions for the extensive organization of service subdivisions. Engineering centers, which originated in the system of the Ukrainian SSR Academy of Sciences a few years ago, will also be developed within the interbranch scientific and technical complexes. Specific departments of the design and technological bureaus of the complex are a part of the center. They work in contact with the corresponding scientific subdivisions of the institute. The production capacities of the pilot works or plant are attached to the engineering center. The centers, by taking upon themselves all the work on the introduction of innovations, enable scientists to concentrate their efforts on the further development of basic research and the creation of a new scientific "springboard" and prepare the conditions for the prompt and large-scale transfer of scientific and technical innovations to the national economy.

[Question] Boris Yevgenyevich, just recently they were arguing: Is basic or applied research more important?...

[Answer] Progress is the best judge and witness. All the revolutionary changes in equipment, technology, and economics, as is known, originate on the basis of basic research. Remember, the famous book of Euclid is titled

"Elements." Basic research is also the very element on which the entire edifice of science is built. Previously tens, or else hundreds of years passed until a discovered truth acquired a specific embodiment. Now a scientist, when engaging in basic development, should clearly imagine the possibilities of its practical use. Moreover, practice itself suggests today the most important direction of scientific research. We are striving to develop precisely such research--goal-oriented, basic research--at our Academy of Sciences. Basic in essence, it has as its end result the solution of specific national economic problems. Let us take, for example, low-temperature physics, its most interesting and most promising direction--superconductivity. Here goal-oriented basic research should lead to results of enormous importance not only for science itself, but also for the national economy. Having mastered the secrets of superconductivity at temperatures greater than cryogenic temperatures, it would be possible to decrease significantly the power losses in electrical equipment, which today amount to 10 percent of the electric power being generated. And not only this. It would be possible to free for economic needs the so-called rights of way, which are occupied by electric power transmission lines and are equal to the territory of several states, and to solve other important problems which practice is posing for us.

[Question] Among them is one of the most topical ones the decrease of the materials-output ratio?

[Answer] I would even say one of the most urgent ones. Two approaches exist for its solution. One of them consists in the establishment everywhere of order and technological and labor discipline. To put it bluntly, we should gather what lies under our feet. It is necessary to engage in this, and, moreover, without delay. But the possibilities here are limited. And the more in an organized manner, the more persistently, and the more effectively we work, the more rapidly we will exhaust them. It is clear that it is impossible to base on this a long-range scientific and technical policy. The other approach consists in the utmost acceleration of scientific and technical progress in the national economy. Already today the achievements of science given their proper use are making it possible to decrease substantially the weight of machines, mechanisms, and structures (unwieldy, heavy equipment, moreover, is not competitive on the world market), to improve their operating characteristics, to reject in a number of cases expensive and for the most part scarce materials, and to replace them with new, advanced materials. This is especially important, if we consider that in the foreseeable future the leading place in the national economy will remain with metals. It is impossible to increase their production endlessly. It is necessary to take the path of the utmost saving of metal and the maximum decrease of its losses.

[Question] Boris Yevgenyevich, you were talking about new materials....

[Answer] Yes, plastics, ceramics.... They are more and more boldly invading our life and are becoming customary. They have a future. But at least until the middle of the third millennium metals will retain first place. The area of their application steadily continues to expand. Moreover, they are practically irreplaceable wherever it is necessary to deal (I will note, more and more often) with extreme conditions: enormous pressures, very low and

high temperatures, corrosive atmospheres, radiation, and so on. Not every material bears "such a thing." Metals also have other merits. For example, it is possible to "program" them in advance, to give them new qualities and the necessary properties. Cracks helped us in solving one such problem?

[Question] Cracks?

[Answer] The most ordinary ones. True, in gas pipelines. They are stranger than any extraordinary event. Having originated, a cleavage crack with supersonic speed runs along a pipe and turns it into a nearly flat metal sheet. Not tens, but hundreds of meters of gas pipeline--kilometers--are ruined in this way. In the United States a kind of record has been recorded--10 kilometers. Scientists gave an apt name to this phenomenon: avalanche failure.

[Question] And is it impossible to check an "obstinate" crack?

[Answer] It is possible to make pipes out of high-strength, cold-resistant, and high-toughness steels, which is being used in practice in several countries. However, this is not always the best means. The production of such pipes is difficult, labor-consuming, and, what is no less important, expensive. The scientists of our institute proposed an original solution of the problem: to "arrest" cracks by means of traps made of multilayer materials, which are welded into the gas pipeline. A crack, falling into such traps, does not spread farther. This development served as the beginning of research which was aimed at the development and extensive use of a new class of composite materials. One of them, which is called reinforced quasimonolithic material, has already found application, in particular, for the production of the beds of 40-ton pit dump trucks. It replaced expensive alloyed steel. The beds became thinner and more reliable and serve longer. This research broadened considerably our notions about metal and its possibilities.

[Question] In the diaries of L. Tolstoy there are words which were addressed to his oldest son. The writer is surprised by why his son doubts the worldly advice and moral injunctions of his father and does not follow them. But he accepts the laws of physics and mathematics unquestioningly, on faith and does not try to recheck them.... In this reproach, apparently, there is a certain share of impartiality. For do precisely the fixed opinion about the unshakeability of some concepts and laws or others and the conservatism of thinking frequently check progress?...

[Answer] Yes, the classical principle of metallurgy refuted electroslag remelting, which was also discovered at one time at the Institute of Electric Welding.... From time immemorial it was believed that steel and slag are enemies. If you do not separate them, consider it as good as lost. But slag proved to be nothing but a friend--a magician. Having passed through it, the metal becomes better with respect to all qualities, like Ivanushka from "The Sea Horse" after a bath in boiling milk. Today electroslag remelting is an entire family of technologies, which was recently supplemented by two "relatives": centrifugal and chill casting, which makes it possible to use efficiently the metal scraps of production and to obtain items of complex form

with the minimum machining allowances. Or there is another example. Let us take a sheet of chrome and bend it slightly, although this is at variance with its nature. Obtained according to a new technology, it is still not capable of such a thing. Incidentally, this technology is especially promising in space.

[Question] In the 1960's, when your institute for the first time proposed welding in orbit, some people did not believe in success.

[Answer] General Designer Academician Sergey Pavlovich Korolev helped us greatly at that time. He and I frequently discussed the future of space technologies. Unfortunately, Sergey Pavlovich did not live to the day when Valeriy Kubasov on the Soyuz-6 with the aid of the Vulkan unit for the first time in the world carried out space welding.

On the orbital station, as in any research laboratory, one has not only to conduct experiments and observations, but also to carry out the installation and adjustment of equipment and the repair of units and assemblies of the station, which have broken down. Moreover, not only inside it, but also outside it--in open space. A tool, which makes it possible under difficult and at times unusual conditions to perform simultaneously several technical operations, is needed for this. Svetlana Savitskaya and Vladimir Dzhanibekov liked very much the general-purpose manual tool--the URI--which was developed at the Institute of Electric Welding. It can cut, weld, solder, and apply coatings. The need for the performance of such operations can arise in the most unexpected situations. Remember, during the flight of Valeriy Ryumin and Vladimir Lyakhov the antenna of the radio telescope caught on the docking unit. Ryumin had to spend time on it. But if he had had the general-purpose manual tool, he would have cut through the antenna cable in a flash with the electron beam.

[Question] Boris Yevgenyevich, what, in your opinion, traits and qualities should a real scientist have?

[Answer] First of all great professionalism and the constant aspiration for self-improvement. Adherence to principles and integrity in the defense of one's ideas and convictions. And, of course, as was noted at the 27th party congress, great civic spirit, an active position with respect to new progressive changes in society, a heightened sense of personal responsibility for the fates of mankind and the entire world. These qualities are not born together with a person. I often recall one incident from the life of my father. At one time he lived and studied in Germany, at the Royal Saxon Technical Higher School. After the completion of his studies, in spite of the flattering invitations to work at the leading centers of Germany, he returned to Russia. In Petersburg they invited him again to sit at a student's desk--for another 3 years. But he was already a trained specialist and wanted to work for the good of Russia. He asked not for privileges, not for benefits, and not for honors. He asked for permission "to gain in Russia the right to the title of railway engineer." Only by dedicated labor and dedication to the matter is it possible to gain the right to be in science. In this aspiration one must not lag behind and become weak, the victory is brief. It has been achieved, and it is already yesterday. It is necessary to acquire knowledge

and experience constantly, in order to evaluate practicably the harmony of one's plans and the affairs of the times. It is necessary to always feel young. My father said that in creative matters youth is determined not by the year of birth, which has been put down on the passport, but by the ability to devote one's entire self to labor and any pursuit.

Science does not tolerate laziness. Nothing so hinders it as a matter which has been put off until tomorrow.

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ADDITIONAL RIGHTS GRANTED TO SIBERIAN DEPARTMENT

Moscow SOBRANIYE POSTANOVLENIY PRAVITELSTVA ROSSIYSKOY SOVETSKOY FEDERATIVNOY SOTSIALISTICHESKOY RESPUBLIKI in Russian No 21, 1985 p 338

[Decree of the RSFSR Council of Ministers, issued on 23 July 1985: "On the Additional Broadening of the Rights of the Siberian Department of the USSR Academy of Sciences"]

[Text] Decree of the RSFSR Council of Ministers

Article 102. On the Additional Broadening of the Rights of the Siberian Department of the USSR Academy of Sciences

The RSFSR Council of Ministers resolves:

1. To grant additionally to the Siberian Department of the USSR Academy of Sciences the right:

a) to approve in consultation with the Republic Committee of the Education, Higher Schools, and Scientific Institutions Workers Union of the RSFSR the list of occupations and positions of workers of subordinate enterprises, organizations, and institutions, for whom supplementary payments are established for the combining of occupations (positions), in accordance with the procedure and on the terms, which are envisaged by Decree No 1145 of the USSR Council of Ministers of 4 December 1981 (SOBRANIYE POSTANOVLENIY PRAVITELSTVA SSSR, No 2, 1982, Article 7);

b) to leave at its disposal for the strengthening of individual directions of scientific research on the solution of basic scientific and technical problems the undistributed reserve of budget allocations for scientific research work in the amount of up to 2 percent of the amount of budget allocations, which are envisaged for the Department, within the limits of the total amount of expenditures on scientific research work;

c) to form a reserve with respect to the number and wage fund of the workers and employees in the amount of up to 1.5 percent of the limit of the number and wage fund of workers and employees, which was established for the Department by the RSFSR Council of Ministers.

2. (Footnote 1) (Paragraph 2 is not cited as containing a one-time assignment.

3. To deem void Paragraph 13 of Decree No 382 of the RSFSR Council of Ministers of 23 June 1979, "Questions Which Are Turned Over for Settlement by the Siberian Department of the USSR Academy of Sciences" (SOBRANIYE POSTANOVLENIY PRAVITELSTVA ROSSIYSKOY SOVETSKOY FEDERATIVNOY SOTSIALISTICHESKOY RESPUBLIKI, No 19, 1979, Article 135).

[Signed] Chairman of the RSFSR Council of Ministers V. Vornotnikov

Administrator of Affairs of the RSFSR Council of Ministers I. Zarubin

Moscow, 23 July 1985. No 314.

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